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Evaluation of Care Planning Documentation following the implementation of an Electronic Patient Record: analysis of contributing factors

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Supervisor: Professor Doutor Paulino Sousa

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Abstract

Introduction: The nursing process has been introduced over 50 years ago and has evolved over the years, however, it still struggles to truly become part of the nursing day to day practice in many hospitals. There have been several studies conducted describing the introduction of standardised languages in particular in conjunction with electronic systems in an attempt to improve nursing documentation and ensure it reflects the nurses' critical thinking. The purpose of this study was to evaluate the use of care planning documentation utilising a standardised language in the context of a recent implemented electronic health record. We also wanted to explore the nurses' perceptions and attitudes towards these concepts and how it affects how much they use it in practice.

Methods: A quantitative approach was followed in a form of a two-phased observational case study. A retrospective longitudinal study, for a period of 13 months, analysing the percentage and content of care plans and frequency of its documentation was combined with a cross-sectional online questionnaire used to ascertain nurses' perceptions and attitudes in three main constructed parameters: *perceived benefits, content* and *usability*.

Results: This study revealed that a vast majority (96.9%) of admitted patients during the observed period had at least one standardised care plan applied and that it has been increasing across all areas of the hospital. It was also observed that the total number of care plan templates (and variability) had consistently increased over the time period in analysis (from 7739 in July 2015 to 29198 in July 2016). In contrast, the study also revealed that very rarely those care plans were then subsequently evaluated and documented. Considering the number of days each patient remained in hospital, only 0.1% had a care plan evaluation documented. The questionnaire revealed that whilst nurses' perceptions of benefits of care planning were positive, the appreciation of content and usability was negative. Statistically significant correlations between the reported used of care planning and a number of variables including the constructed ones for *perceived benefits* (rho .342)*, content* (rho .680) and *usability* (rho .305) were found. It was also found statistically significant the relation of training and use of the system.

Conclusion: Electronic health records and associated clinical decision support systems can contribute to completeness of documentation. Training and staff engagement are critical to truly embed the use of purposely nursing documentation in order to deliver the benefits of a structured and standardised method.

Keywords: Nursing documentation; Nursing terminology; Electronic Health Records; Decision Support Systems, Clinical; Nursing

Resumo

Introdução: O conceito de processo de enfermagem vem sendo utilizado e desenvolvido há cerca de 50 anos, ainda assim existem barreiras a que seja usado na prática em muitas realidades hospitalares. Já vários estudos se dedicaram à introdução de linguagens estandardizadas, com particular relevância quando em conjunto com a implementação de sistemas de informação de enfermagem numa tentativa de melhorar a documentação que os enfermeiros produzem e fomentar o pensamento crítico. O objectivo deste estudo foi avaliar o uso de plano de cuidados recorrendo a linguagem estandardizada no contexto recente da implementação de um sistema de registos clínicos eletrónicos. Ao mesmo tempo procurou-se explorar as percepções e atitudes dos profissionais de enfermagem em relação ao mesmo e tentar perceber em que medida essas atitudes influenciam o uso do sistema na prática.

Metodologia: Foi feita uma abordagem quantitativa fazendo uso de dois mecanismos de recolha de dados distintos. Numa primeira fase foram analisados dados do próprio sistema eletrónico quanto ao número e frequência de planos de cuidados utilizados e numa segunda fase foi lançado um questionário com a intenção de perceber quais as atitudes e percepções dos enfermeiros em relação a três domínios: *benefícios, conteúdo* e *facilidade de uso.*

Resultados: Este estudo permitiu revelar que a larga maioria dos doentes admitidos (96.9%) durante o período observado tiveram pelo menos um plano de cuidados aplicado e também que essa percentagem ainda foi aumentado ao longo do tempo. Também foi possível constatar que o número total e planos de cuidados (e a variedade) foi aumentando de forma consistente ao longo do período a que os dados fizeram referencia (de 7739 em Julho de 2015 para 29198 em Julho 2016). Em contraste com estes achados, verificou-se que os planos de cuidados existentes eram muito raramente subsequentemente documentados e avaliados. Considerando o número de dias que cada doente permaneceu internado verificou-se que apenas 0,1% desses corresponderam a uma documentação existente. As respostas ao questionário revelaram que, por uma lado, as percepções dos enfermeiros dos benefícios dos planos de cuidados eram positivas, mas por outro, que a apreciação do conteúdo e facilidade de uso foi negativa. Foram também encontradas relações estatisticamente significativas nas respostas ao questionário quanto ao uso dos planos de cuidados e variáveis *benefícios* (rho .342), *conteúdo* (rho .680) e *usabilidade* (rho .305). Também se verificarem relações estatisticamente significativas entre o treino específico quanto ao uso do sistema e a frequência com que os inquiridos declararam fazer uso do mesmo.

Conclusão: Os sistemas de informação clínicos, associados a mecanismos de suporte à decisão podem contribuir para que a documentação seja mais completa. Treino e envolvimento do pessoal clinico é fundamental para que eles sejam usados de forma satisfatória de forma a virem a tirar benefícios da implementação dos sistemas de informação na prática clínica.

Palavras-Chave: Documentação de Enfermagem; Nomenclatura de Enfermagem; Sistemas de Informação em Enfermagem; Sistema de Suporte à Decisão

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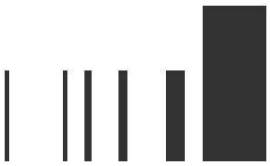
Abbreviations and Acronyms

A&E	Accident & Emergency
BPA	Best Practice Advisory
CDS	Clinical Decision Support
CPOE	Computerized Physician Order Entry
CUH	Cambridge University Hospitals
D&M IS	DeLone & Mclean Information Systems
EHR	Electronic Health Record
HDU	High Dependency Unit
HIMSS	Healthcare Information and Management Systems Society
IT	Information Technology
ITU	Intensive Treatment Unit
K-S	Kolmogorov-Smirnov
NANDA-I	North American Nursing Diagnosis Association International
NIC	Nursing Interventions Classification
NMC	Nursing and Midwifery Council
NNN	NANDA-I, NIC and NOC
NOC	Nursing Outcomes Classification
SD	Standard Deviation
SQL	Structured Query Language
UK	United Kingdom
UKCC	United Kingdom Central Council



1. Introduction

Chapter 1 - Introduction

Nursing documentation has been targeted in numerous studies over the years in an attempt to establish internationally recognised standards and to pave the way from handwritten of typed as free-text. Nursing care plans, as a subset of clinical documentation, have the primary objective of serving as a guide to the caregiver and to record the client's status and response to the treatment provided. This nursing documentation is essential as a support for communicating the patient's progress and condition within the health care team and it should reflect the nursing clinical thinking described by the nursing process (Carpenito-Moyet, 2014).

The nursing process, by making use of standardised terminology, provides a good structure for the documentation of the nursing care in electronic systems not only facilitating decision making in patient care and care planning but it also enables data to be utilised in clinical research, health care management, health services planning and even for governmental reporting (Hayrinen *et al.*, 2010). There are several studies highlighting the role of Electronic Health Records (EHR) in the standardisation and structure of the documentation increasing the potential use of the information collected. By making use of a standard language, computerisation allow for high level data analysis which can contribute greatly for the scientific knowledge by identifying relations between problems, interventions and their respective outcomes (Wyatt & Wright, 1998; Lundber *et al.,* 2008; Weaver *et al.,* 2005; Rutherford, 2009).

In an attempt to reduce the time spent in documentation as well as to help nurses to follow a common plan in caring for specific group of patients based on up-to-date, evidence based knowledge, many organizations make use of standardised care plans (Dahm & Wadensten, 2009).

The North American Nursing Diagnosis Association International (NANDA-I) who has been instrumental in the development of nursing body of knowledge is one of the most widely used terminology systems in the world but still very little known in the United Kingdom and in the National Health Service (NHS), hence the importance of studies like the one being presented.

1.1 Statement of the problem

There have been many studies conducted to describe the nursing documentation, both with and without resource to electronic systems, describing the introduction of the standardised languages in an attempt to improve documentation, mostly in terms of accessibility, readability, completeness, structure and some even studying relationship between nursing documentation and patient outcomes (Thoroddsen *et al.*, 2011). Most of the studies analysing the utilisation of standardised languages are from North

America and more recently Europe, however there is very little research conducted in the United Kingdom where very little is known on the use of both electronic health records and standardised nursing nomenclatures.

The implementation of an Electronic Health Record is a major change process for all players involved, in particular affecting nursing practice and nursing care planning documentation as it normally involves a shift from unstructured documentation in the form of narrative reports to very structured electronic care planning with the use of international classifications (Meum *et al.,* 2013)

1.2 Purpose of the study

The purpose of this study is to evaluate the use of nursing care plan documentation as an expression of the nursing process and the use of a standardised language in the context of a recently implemented HER. We also want to explore the nurses' perspectives as end user of the electronic system trying to understand their attitudes and perceptions towards its use and the benefits, content and usability as well as discuss the use of Clinical Decision Support (CDS) as a way of enhancing the adoption of the introduced model.

1.3. Research questions

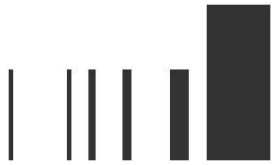
This study will try to answer the following questions:

- How much are the care plans being utilised in recently deployed electronic health record?
- What are the nurses' perceptions and attitudes towards benefits, contend and usability of the system?
- What bearing do those attitudes and perceptions have in the perceived utilization of care planning module within the EHR?

1.4. Thesis structure

The content of this thesis is divided in 6 chapters. The present chapter is an introduction to the thesis. In Chapter 2 there is an extensive examination of the literature to find current research on nursing care planning documentation, particularly in the context of an Electronic Health Record. Chapter 3 discusses the methodological choices that were made for this research discussing how decisions were reached regarding the chosen methods. Chapter 4 will present the results and of the two phases

of the study and the analysis performed for each of the research methodologies. Chapter 5 will discuss the main findings and correlate with previous studies as well as outline limitations of the present study. Chapter 6 presents a conclusion to this thesis and recommendations for future research.



2. Review of the literature

Chapter 2 – Review of the literature

The first part of this chapter describes the literature review methods and how certain articles were selected for consideration. Next, it summarizes the findings of such review by exploring the significance of the nursing model and use of standardised languages in the context of electronic health records and how such utilization has been evaluated in previous studies. Then it explores the role of electronic health records and their benefits as well as the difficulties with its implementation. Lastly it also explores the use of decision support systems in the context of an electronic health record.

2.1. Literature review methods

A comprehensive literature search was performed at the beginning of this research and was complemented and updated throughout the study. The initial review of literature was conducted systematically by searching the following databases: Cinahl, Medline, Pubmed, ClinicalKey and ISI Web of knowledge. The keywords included 'nursing care plan', 'nursing documentation', 'NANDA implementation', 'care planning in electronic health records', 'nursing electronic patient records', 'standardised language AND nursing care plans', 'electronic health record evaluation', 'clinical decision support in nursing', 'improving nursing documentation', 'nursing evaluation of electronic health records'. The language of retrieved studies was restricted to English and Portuguese and the results filtered to only show articles between 1995 and 2016 which returned journal articles, research articles and systematic reviews. Commentaries, brief items, and responses were excluded. The initial results of this research mounted to 715 articles and their relevance to this study was subsequently assessed by reviewing the full title and abstracts. Articles related to specific applications such as computerized physician order entry (CPOE), laboratory and result reviewing, e-prescribing, procedural areas or imaging were rejected. Also since the aim of this study was focusing on nursing care planning, those articles referring to outpatient areas were also excluded. In addition to the search described above subsequent searches were conducted in the ResearchGate platform, Google and Google Scholar. This resulted in 54 articles found to be considered relevant to this study, some of them couldn't be obtained in full due to proprietary licensing, leaving a total of 34 articles used for this review. Articles that originally were not possible to access had their abstracts analysed and those that after review were considered relevant were obtained through library services or by contacting the respective authors. A second tier search was also performed based on references of the initial review.

2.2 Nursing Process and Care Planning

The nursing process was first described by Yura & Walsh in 1967 as a structured, problem-oriented approach to nursing practice and structure of nursing documentation. Described then as a systematic and analytical approach to care that involved four stages: assessment, planning,

implementation and evaluation and it was recognised its use in the UK by the United Kingdom Central Council (UKCC) in 1977 (Yura & Walsh, 1967 cited by Barret, 2012).

Later an additional phase of 'nursing diagnosis' in between assessing and planning was introduced. These 5 stages process is how the nursing model is most commonly described today as a dynamic, interactive, systematic and holistic approach, encompassing 5 cyclical stages – Assessment, Diagnosis, Planning, Implementation and Evaluation and describes how nurses organise the care of individuals, families, groups and communities (Doenges & Moorhouse, 2008; Meleis, 2011). The success of the nursing process is attributed to its nature as a process rather than a context which makes it compatible with different nursing models, theories, languages and even computer systems (McEwen & Wills, 2011).

The nursing process has since been promoted by several health-organizations worldwide such has the World Health Organization (1982), the International Council of Nursing (Clark, 1994), the American Joint Commission on Accreditation of Hospital Service Standards (1991) and the United Kingdom Central Council (1993).

Patient health records are the single most important tool for information and communication in healthcare and the nursing profession plays a central role as coordinator of the care provided by the multidisciplinary team and are often the ones that most contribute to generate patient information (Bjorwell *et al.*, 2000, Martin *et al.*., 1999). The quality of nursing documentation has therefore major implications to the ability to care for patients and has been highly influenced by legal, management and professional issues. The Nursing and Midwifery Council (NMC) in the UK released specific guidelines to record keeping and have described record keeping as a fundamental part of nursing in 2004 superseding earlier guidelines from the former United Kingdom Central Council for Nursing, Midwifery and Health Visiting (1998). Nursing documentation has not only a central role in storing information and serve as a communication tool and of providing evidence of nursing practice and accountability but also used to support different philosophies of nursing practice (Currel & Urquhart, 2003).

The nursing care plans, as part of the clinical documentation, have the primary objective of serving as a guide to the caregiver and to record the client's status and response to the treatment provided. This nursing documentation is essential as a support for communicating the patient's progress and condition within the health care team and it should reflect the nursing clinical thinking described by the nursing process. They are written structured plans-of-action based on the nursing assessment of the patient needs, indentifying the focus of the nursing attention, detailing the plan of action to respect of the identified problem and evaluating the efficacy of such interventions (Carpenito-Moyet L, 2014).

In order to assist with the adoption of care plans and make use of evidence base resources whilst at the same time reduce the time spent with documentation, many organisations chose to use standardised care plans (Dahm & Wadensten, 2009). Of course there are drawbacks with this approach, as those explored by Lee and collaborators (2002) in an article following the implementation of a Nursing Care Planning System in an ITU in Taiwan. Although overall viewing standardised care plans as positive, the main concern was over de-individualization of the care plan and the loss of critical thinking. Other issues highlighted were around increasing time on documentation and difficulties in using standardised nursing diagnosis. Similar conclusions

were reached by Mahler and collaborators (2007) in a similar study this time across 4 different wards in a Germany University Hospital, where the number of problems, outcomes and interventions documented increased greatly but not always adapted to the patients needs.

International acceptance of the nursing process hasn't been without its critique, in particular for overlooking the traditionally intuitive and subjective of the nursing profession and of reducing the view of the patient to defined set of problems and for suggesting difficulties with complying with structure requirements seen as increasing the gap between theory and practice (White, 1993; Oroviogoicoechea *et al.*, 2008).

In one of the few studies from the United Kingdom conducted by Allen (1998) in a qualitative study in a single ward through interviews and observations highlighted the practice of nurses developing shadow documentation systems (informal records and ward diaries or handover sheets not part of the official clinical record) due to low significance attributed to the structured nursing documentation dictated by management. Similar findings discussed in another qualitative article from the UK by Hardey and collaborators (2000), in this case in electronic format. Another study conducted in the United Kingdom, this time in Northern Ireland, again a qualitative observational study, by Mason (2000) comparing 4 separate but similar units, found that in 3 out 4 of the units, care plans were not really utilised and were viewed as discouraging thinking due to standardised format and hindering individualization of care. In the one unit that care plans were integrated with practice, attitudes towards care plans were generally positive and the care plans were used to enhance communication and to guide practice.

2.3. The use of Standardised Nursing Terminologies

Standardised nursing terminologies are structured vocabularies that provide nurses a shared mean of communication, a common language as often is described that forms the base of knowledge of the nursing discipline (Rutherford, 2009).

The use of standardised languages has the potential to provide benefits to patients, organisations and even the nursing profession as a whole. The main benefits include improved communication among nurses and other multidisciplinary professionals as well as with patients and at the same time increasing the visibility of nursing interventions and providing support for documentation of the nursing process (Rutherford, 2009).

Benefits for patients consider the impact of unambiguous communication between professionals enhancing continuity of care. Organizations benefit with the ability to measure nursing activity and its impact on patient outcomes, in particular through electronic health records (Lundberg *et al.*, 2008). As a profession, nursing benefits from have a common language, enhancing documentation, storage and evidence-based practice that can be evaluated systematically facilitating nursing research (Weaver *et al.*, 2005).

There are several nursing classifications and taxonomies currently used around the globe, namely Nursing Minimum Data Sets, NANDA-I, Omaha Community Health System, Nursing Intervention Lexicon and Taxonomy, Nursing Interventions Classification, Nursing Outcomes

Classification, International Classification of Nursing Practice, International Nursing Minimum Data Set, etc.

This thesis focus is on NANDA-I, paired with NIC (Nursing Interventions Classification) and NOC (Nursing Outcomes Classification), together often referred to NNN which are amongst the most commonly used. These are also the taxonomies in use in the setting of this study. NANDA-I defines nursing diagnosis as "a clinical judgment about an individual, a family, or community responses to actual or potential problems / life processes which provide the basis for definitive therapy towards achievement of outcomes for which a nurse is accountable" (NANDA-I, 2009, p.367). The Nursing Interventions Classification (first published in 1992) lists and catalogues nursing treatments that nurses perform to enhance patient outcomes. In order to measure the effectiveness of nursing interventions it emerged the need for an outcomes classification. In response to this need the Nursing Outcomes classification was first published in 1997.

These three terminologies unified contain the basic components necessary to the nursing process and can be used in all health care settings. They are increasingly used in clinical information systems as source languages allowing documenting the nursing care and its associated judgments, activities and achievements of identified outcomes.

Several studies describe the successful integration of these languages in clinical information systems (Hendrix, 2009; Khler *et al.*, 2009; Keenan *et al.*, 2003). Some have also pointed out the importance of staff education when implementing the three languages where staff is not familiar with them (Klehr *et al.*, 2009; Lunney, 2006). These researchers described how the lack of knowledge of the standardised terminologies could lead to its incorrect use and pointed out the role of education on how to use these to achieve consistency.

Thoroddsen and collaborators (2011), in a pretest-posttest study comparing content of documentation before and after implementation of NANDA-I, NIC and NOC in an Icelandic 800-bed university hospital verified the increase of completeness of nursing documentation after the introduction of NNN which was introduced in advance of the EHR go-live. The biggest impact of the EHR introduction was the wider variety of nursing diagnoses and documentation of related factors and nursing interventions all increasing which was inferred as an evidence of individualisation of care.

The current study was developed in a setting where two simultaneous changes occurred, the introduction of an electronic health record (EHR) – eHospital with the 2014 version of Epic® Systems software and the introduction of a standardised nursing language – NANDA-I combined with the Nursing Interventions Classification (NIC) and Nurses Outcomes Classification (NOC). This was not at all unique as often organizations chose to take advantage of the introduction of an electronic system to introduce a standardise taxonomy (Sousa, 2006). Having a structured taxonomy helps to capitalise the introduction of an electronic system, by allowing to make use of discrete data captured electronically, increasing the potential of interoperability, providing a structure for the documentation, improving charging workflows and enabling measurement of workload and efficacy of care provided.

2.4. Electronic Health Records

The implementation of information technology (IT) in healthcare offers the opportunity to enhance clinical practice and increase efficiency and effectiveness in healthcare organisation, as the quality of information available to healthcare providers directly impacts the quality of care (Currel & Urquhart, 2003; Silva, 2006; Sousa, 2006). IT can contribute immensely to the accessibility and interpretation of patient data allowing it to be more useful in clinical practice, saving important time and increasing the level of knowledge of the healthcare providers when making clinical decisions and this has provoked its adoption in healthcare organizations (Sousa *et al.*, 2015; Yee *et al.*, 2012).

It is well established that the use of a recognised formal nursing language in a nursing information system such as an EHR in a structured way can contribute to better data capture by nurses (Nahm & Poston, 2000; Daly *et al.*, 2002; Urquhart & Currell, 2005). The use of standardised predefined care plans for example have proven to be effective in documenting the plan of care for patients and making patient records more complete although also associated with an increase time expenditure in the individualisation of care (Ammenwerth *et al.*, 2001). Some of the reported benefits include increase of documented problems, outcomes and interventions and evaluation of care plans improving the documentation of all phases of the nursing process (Mahler *et al.*, 2007).

Nursing is increasingly involved in the study of the impact of IT systems in the healthcare environment, driving some of the research in this area, and the appearance of nursing informatics as a discipline is an indication of this. Graves and Corcoran (1988) described it as a combination of computer, information and nursing sciences, to assist with the management and processing of nursing information to support the delivery of nursing care. 28 years later, there is still lack of solid knowledge base within the nursing informatics literature and the need for further research of the implementation, adoption and benefit realisation of the implementation of health information systems remains evident (Oroviogoicoechea *et al.*, 1998).

Similar to the introduction of a standardised language, the integration of computers into nursing practice has also proved to be challenging (Lee, 2004). Multiple factors affecting the adoption of computerised documentation systems have been identified, normally of two categories: behavioural and organisational (Moody *et al.*, 2004). Organisational factors include level of engagement or early involvement of end users, hardware quality and availability, usability, training, innovation and leadership and even software capability issues. The behavioural factors are often described as attitudes and perceptions of information technology (Darbyshire, 2004; Lee *et al.*, 2005; Lee, 2006; Moody *et al.*, 2004; Smith *et al.*, 2005; van Ginneken, 2002).

Although the reference to nursing diagnosis is widely used in nurse care planning literature, the integration of such terminology in nursing practice is still proving problematic. Reasons for the poor implementation are: high documentation efforts, low quality of paper-based records and limited general acceptance of the nursing process (Mahler *et al.*, 2010). In one of the first articles referring to the implementation of an electronic care planning system in the UK written by Newton (1995) it was explored the nurses attitudes towards the new care planning system and the nursing process. The results showed that the overall perception was negative and it took more than one year for the nurses to shift towards positive attitudes. Similar findings were observed by

Larrabee and collaborators (2001) in a study conducted in Tennessee (USA) evaluating the nursing documentation, before and after implementing a nursing information system, only recorded an increase in documentation quality after 18 months and only after retraining of nurses.

Oroviogoicoechea and collaborators (2010) developed a questionnaire to ascertain the nurses' perceptions of the use of an IT system in clinical practice. This tool was designed to capture nurses' opinions of the impact and use of an electronic clinical system, falling in the category of an IT evaluation system. Although one of the factors considered was the quality of the information of the nursing record, it wasn't particularly focused on the nursing documentation or nursing care planning. Kahouei and collaborators (2014), again through the use of questionnaire, in a descriptive qualitative case study involving 316 nurses in a two teaching hospitals in Iran found to statistical significance association between the demographic background of the sample, namely computer experience, and their perceptions of usefulness of the EHR ($\rho < 0.05$). In this study the overall perception of nurses was negative towards the use of electronic system in clinical practice and there was no attempt to investigate the impact of these attitudes in the perceived system use or to investigate the reasons behind the negative perceptions.

The measurement of success of an information systems implementation is not easy to define. Success is a multi-dimension concept and includes individual, organisational and system factors. van der Meijden and collaborators (2003) in a literature review covering from 1991-2001, concluded that system and information quality are the aspect most often analysed in evaluation studies of IT systems and that both affect usage and user satisfaction.

User satisfaction and actual usage of the system are two of the aspects mostly considered when evaluating the implementation of information systems. A benchmark in information systems evaluation remains the DeLone & McLean Information Systems (IS) Success Model (hereafter referred to as the "D&M IS Success Model". In the D&M IS Success Model 'system quality' is considered the measurement of technical success, 'information quality' measuring semantic success and 'user and user satisfaction' as well as 'organizational impacts' measure effectiveness success.

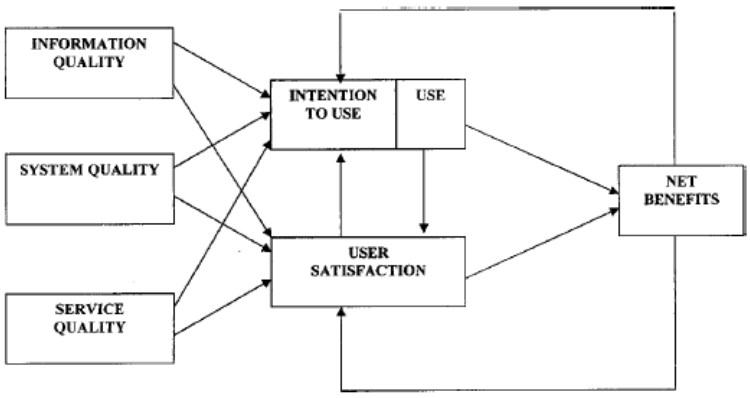


Figure 1: The D&M IS revised in 2003 (Delone & Mclean, 2003)

Ten years after the first publication of the D&M IS Success Model in 1992, the same authors published an update article (2003) in which a review of research contributions following the

publication of the model was performed. In this review DeLone & McLean defend the 'system use' as a success variable but caution that the nature of its use must also be considered. Arguing that the use of a system doesn't mean it's used appropriately, meaningfully or in the extent required. The authors also reject the notion of totally mandatory and argued that even when system use is required there is variability in the quality and intensity of its use which can have a significant impact on the realisation of its benefits. In the D&M IS Success Model the user satisfaction is intertwined with use and intention to use and both contribute and benefit from the effects of the system.

User acceptance, a term often interchanged with user satisfaction reflects how much a system fits the characteristics of its users and the characteristics of the task in hand. Therefore, user acceptance can be seen as a measurement of how much the use of an information system supports users in their clinical practice. Research studies evaluating user acceptance often make use of psychometric questionnaires in order to measure quantitatively this construct (Ammenwerth *et al.*, 2003). In this context, nurses' attitudes are described as playing a key role in nursing information systems implementation success (Marasovic *et al.*, 1997; Dillon *et al.*, 2005).

Attitudes towards a particular behaviour and the individual's perception of social pressure to behave determine that person intention to behave in a certain way as explained by the theory of reasoned action described by Ajzen & Fishbein in 1975. According to this theory, people tend to behave in a certain way when such behaviour is perceived as positive and considered important and other people think it should be performed (Ajzen, 1991).

2.5. Clinical Decision Support systems

Clinical decision support (CDS) is a process that provides healthcare professional with general and person-specific information, at appropriate times to facilitate clinical decision making. A clinical decision support system is often how a computer program or functionality within a clinical information system helps to deliver that information and can be used to facilitate adherence to clinical guidelines and promote best practices, provide alerts and reminders thus prevent errors and enhance processes and streamline workflows for improved patient care (Osheroff *et al.*, 2012). One of the applications of CDS in nursing informatics is the potential to guide the use of standardised nursing care plans (Thoroddsen *et al.*, 2011).

Whilst the use of CDS in improving clinical practice is now well documented, studies tend to be focused on medical workflows and the benefit of providing patient-specific recommendation at the point of care to facilitate the decision process. Little research has been conducted on the benefits of such systems for nursing (Kawamoto *et al.*, 2006; Thoroddsen *et al.*, 2011).

The clinical judgments that evolve from the nursing practice depend on the nursing professionals' ability to analyse, interpret and infer from the available data. This, according to Sousa (2006) can be supported and enhanced in a context of a Nursing Information System if based in relevant data that help to inform the nurses in their decision process. Osheroff (2009) also described the potential of CDS in helping new nurse clinicians and nursing student to learn nursing practice and guide their actions and decision.

3. Methodology

Chapter 3 – Methodology

This section will describe the proposed study design, the data collection process and method of analysis It aims to explain and justify how decisions about the research design were made, and to describe how the literature review, the study objective and in particular the research questions influenced the methodology of this thesis.

3.1. Research Paradigm

The paradigm can be described as the set of assumptions about the world, often also described as philosophical 'worldview', and is influenced by experiences, culture and past history (Creswell & Plano Clark, 2011). The research paradigm is a set of beliefs about how elements of research fit together and influence its design (Creswell, 2013). The type of beliefs held by the researchers often lead to embrace qualitative, quantitative or mixed research approach (Creswell, 2013).

Paradigms have been extensively discussed in the research literature (Bryman, 2012; Creswell, 2013; Creswell & Plano Clark, 2011; Denzin & Lincol, 2013; Kurnar, 2011; Polit & Beck, 2014; Punch, 2005; Howlett, Rogo & Shelton, 2013). The research paradigms are classically described in a dichotomy between positivism (quantitative) and naturalism (qualitative) which are naturally opposed to each other. In an attempt to support paradigm integration and the utilisation of mixed research methods approach to utilise the positive characteristics of both quantitative and qualitative research, another worldview has emerged, pragmatism (Punch, 2014).

Naturalism has emerged from social sciences, primarily from anthropology, as researchers felt the need to understand and describe phenomena experienced by people and the nature of the people studied. Naturalistic research examines settings in their natural state and its goal is to gain a deep understanding of the reality and to develop a rich description of the same (Howlett, Rogo & Shelton, 2013).

In healthcare is more commonly used by nursing research initiatives as they tend to seek greater understanding of phenomena in practice and the methodology utilised – namely interviews, field notes, observational diaries and journals – fits well with the nursing practice.

The positivist paradigm, generally connected with quantitative research has its roots in physical science, is based on the idea that the world can be described objectively as opposed to subjective view associated with naturalism. This approach has been challenged when applied to human sciences with the idea that one cannot be truly 'positive' when studying human behaviour, rejecting the notion of absolute knowledge. This paved to way to post-positivism which aims to define and assess the causes that influence outcomes with a certain degree of probability. Post-positivism studies the relationships between variables and is also described as the scientific method (Howlett, Rogo & Shelton, 2013).

Pragmatism has emerged with the increasing prevalence of mixed methods research and the struggle to confirm with a single worldview or paradigm (Creswell & Plano Clark, 2011; Venkatesh, Brown & Bala, 2013). It focuses on the research problem and uses multiple approaches to examine the questions. Researchers choose the methods, techniques and procedures that provide the best understanding o the research problem (Creswell, 2013).

The research conducted as a base for this thesis followed a post-positivism worldview in where the phenomenon is being studied in an objective way but accepting that absolute truth can never be found. The data is being analysed to form rational considerations and shape knowledge, looking at the reality and seek to explain it by studying relationships of different variables (Creswell, 2013; Howlett, Rogo & Shelton, 2013; Polit & Beck, 2014).

3.2. Research approach

The research approach, also described as strategy of inquiry or research methodology, is highly related to the philosophical perspective of the researcher worldview. As discussed in section 3.1. the research approach follows on one of three categories: qualitative, quantitative and mixed methods (Creswell, 2013).

The research approach determines the study design which describes the methods and procedures utilised such as those of data collection and analysis and how the main research questions will be answered (Kumar, 2011).

This present study can be defined as following a quantitative approach, in light with the identified post-positivism paradigm as it is thought to be objective and aimed at understanding the underlying phenomenon and aims to provide evidence to answer the research questions.

A quantitative approach is associated with ordered disciplined procedures to acquire information (Polit & Beck, 2008). In this type of approach, data is gathered systematically and categorical and numerical data is analysed using statistical procedures (Creswell, 2013; Polit & Beck, 2008).

The research approach was decided following the literature review that revealed that research describing nursing care planning documentation in the United Kingdom using EHR was very limited (as discussed in chapter 2), in order to provide detail about this phenomenon. The subject being investigated in this research included the presence or absence of care planning documentation for admitted patients in the electronic health records as well as the content of documentation and whether or not it was being routinely evaluated following the nursing process. It was felt that a quantitative approach would best describe the level of existing documentation and this was then compared to a questionnaire exploring attitudes and nurses' perceptions.

3.3. Research strategy

The research strategy or style indicates the form of inquiry taken to answer the research questions (Punch, 2014). There are many types of quantitative research which can be grouped into three main categories: observational, quasi-experimental and experimental (Howlett, Rogo & Shelton, 2013).

The present study can be described as observational. Observational studies describe the phenomena without introducing an intervention or variable. This type of research can be used to identify trends or variables of interest (Howlett, Rogo & Shelton, 2013).

From a time dimension, this study had two separate phases: it had a retrospective longitudinal design as it involved collecting data over an extended time period; and a cross-sectional phase in the form of a questionnaire that was only applied in a single point of time – coinciding with the end of the care plan documentation data collection period (Howlett, Rogo & Shelton, 2013). It can be considered as a case study as it involves detailed and intensive analysis of a single case (Bryman, 2012). Case studies can include the observation of a single unit which can be a person, group, setting or an organisation (Creswell, 2013). It can be used to expand the knowledge and explain unique features of a particular interest (Kumar, 2011).

The present research aimed to investigate the care planning documentation in the electronic health record in a single hospital setting. Having this clear boundary allows it to be described as a single case study. Since it is observational and descriptive in perspective it can be furthermore described as an idiographic case study research (Bryman, 2012; George & Bennett, 2005).

The absence of similar studies in the United Kingdom found during literature review justifies the case study as a strategy in the early stages of studying a particular phenomenon (Bowling, 2009). The descriptive nature of an idiographic case study research justifies the quantitative approach as it aims to describe the nature and intensity of the identified problem (Bryman, 2012; George & Bennett, 2005, Punch, 2005).

Although providing less evidence level then an experimental design, the descriptive co-relational study being proposed should still offer a degree of supporting evidence in addressing the research questions (Polit & Beck, 2014).

3.4. Data collection

The data collection methods are the specific techniques and procedures that a study uses to gather and analyse the information in a systematic way (Polit & Beck, 2014).

Data sources are normally described as primary or secondary. Primary data refers to that collected from a primary source, e.g. by conducting an interview or a having user answering a questionnaire about their use of a computer system. Secondary data, on the other hand, is data collected from existing sources, such as hospital records which are the quintessential source of secondary data in healthcare research more and more so with the proliferation of electronic health records that facilitate its availability and use (Polit & Beck, 2014).

When using a quantitative method it's critical to identify the specific information that is needed. Therefore it's important to design a research instrument or data collection tool that will provide the necessary data to answer to research questions (Kumar, 2011). Data collected from secondary sources such as existing patient records needs a detailed and functional instrument to ensure appropriate data is generated. Similarly, careful consideration needs to be taken in the design of questionnaires as a primary data source so that to make this instrument a valuable source (Bryman, 2012).

This particular study makes use of both primary and secondary data sources. The former being a self-administered (online) questionnaire developed to assess the nurses' attitudes and perceptions

towards care planning documentation and the latter by retrieving usage information directly from the EHR.

Analysing this study under the light of computer systems evaluation, one can consider this study as in the evaluation of human factors phase. Burkle and collaborators (2001) distinguished the different phases of software system evaluations: verification, validation, assessment of human factors and study of clinical effects. Verification tends to answer the question 'Was the system built correctly?' checking whether the system has been configured according to the required specification. Validation aims to answer the question 'Was this the right system?' evaluating if the system in the working environment is actually performing what it was designed to do. Evaluation of human factors, on the other hand, aims to answer the question 'Has the system been accepted and is it being used'. Lastly, the evaluation of clinical effect will address the question 'what clinical effect has the system?'. The clinical effect is best measured using randomised controlled trials, however this is not always possible as described before so other qualitative methods can also be utilised. For the human factors evaluation the utilisation of questionnaires is an obvious choice, as they can be quickly accomplished with limited resources. However as also described by Burkle and collaborators (2001) the use of a simple questionnaire alone is often insufficient, and recommends the use of mixed approach combining different indictors such as system usage to derive a conclusion about system impact.

3.4.1. Care plan documentation retrieved from EHR

As described previously, determining the information required from the electronic health record (EHR) was a critical step in designing the data collection tool. The EHR system provided by Epic Systems® discretely captures care planning documentation in their database, for each hospital encounter it was possible to identify when care plans templates were present (and which). The aim of this study was to describe the evolution of care planning utilisation and the impact of decision support systems in increasing its use therefore was also considered important not only to measure the extent of which care plan templates were being used but also if nurses actually document against such care plans which in the EHR causes a specific care plan note type to be filed for that patient encounter. It was therefore by reporting on the number of these specific care plan notes filed that it was monitored whether the care plans were being utilised in practice.

Due to the complexity of the data required this was accomplished using three different reports from the EHR (Table 1). The data collection period was the same for all 3 reports and went from the 1st of July 2015 to the 31st of July 2016, retrospectively retrieving data recorded against patient care episodes that occurred in the defined period. The main metrics considered were: the percentage of patients with at least one care plan template assigned during each inpatient episode, for each day that patients remained admitted whilst having an active care plan template how many had their care plans documented and lastly how many individual care plan templates (and which) each month for the duration of this study.

Table 1 – Data collection tools from the EHR

Report	*Description*	*Population*
A) Care Plan Exists	% of admitted patients for which a care plan (whether resolved or not) has been applied	All inpatient stays with a duration >= than 24 hours
B) Care Plan Note filed per inpatient day	% of days for which a care plan note was filed for patients with an active care plan template applied	All inpatient stays with a duration >= than 24 hours for which there was an active care plan
C) Care Plan Templates utilised	Total of times each care plan template was utilised by month	All inpatients for the time period in analysis

All three reporting tools were looking back over a period of 13 months, from 1st of July 2015 to the 31st of July 2016. Also all three reports had the information about the patient location (hospital department) and the first two (A and B as referenced in Table 1) included additional information such as admission date and time and discharge date and time.

For report B) as labelled in Table 1, this intended to measure how often the care plans were being documented and followed the operationally developed compliance tools built in such way that instead of measuring the total of times a care plan is evaluated during a patient stay it only considers whether at least one evaluation has occurred per each day that lasts the inpatient episode. The intention is to discount potential false positives by documentations that may be frequent during the first day of admission whilst adjusting the plan of care and then less frequent sub sequentially.

The main benefits of utilising this secondary data as a research method include its availability since this information was already record in the system in a discrete form so there was little analysis needed, simplicity of use (the reports obtained were easily extracted to excel tables making its interpretation and analysis easier) and ability to handle large amounts of data allowing us to report on a large period of time.

The main difficulty with this tool was that it was required to create specific reports to query the existing Clarity® (Microsoft SQL® server) database with the required information – this needed to be configured by the data analytics specialist team which caused some delays in the data retrieving phase of this study.

3.4.2. Online questionnaire

The aim of this study was to evaluate the use of the care planning documentation in the EHR and the nurses' opinions on the tools and content available in the system. To assess the latter it was decided to develop a simple questionnaire that was circulated via internal e-mail through the hospital's nursing network.

As part of the literature research it was tried to indentify a validated tool in order to make the results of this study comparable with the work of others, however no such tool was found to answer the objectives of this study.

The questionnaire consisted of 28 questions, mostly using a 5 point Likert-type scale structure. It was divided into 3 main sections: 9 psychometric questions inquiring about the user perceptions and attitudes towards nursing care planning with closed answer format in a 5 point Likert-type scale; 1 question about the frequency of using the care planning activity within the system and then depending on the answer to this question further drill down questions (9) were asked to those that did use the care planning tools about their opinion of the available content – all equally using 5 point Likert-type scales; if the respondents select that they 'never' use the care planning activity they were presented with a question asking to identify the reasons for not doing so and regardless of their answer to the same trigger question all respondents were asked about the method of applying or suggesting care plans in the system (2 items, 1 in a 5 point Likert-type scale format and another in a ranking grid); lastly it asked the respondents 8 questions about themselves in order to characterize the sample and allow to explore variations in the submitted answers. Table 2 summarises the objectives of the selected questions and how they were grouped.

Table 2 - Evaluation parameters of the nurses perceptions used

Evaluation parameters	**Item in questionnaire**	**Objectives**
Use of the system		
How much of the system is actually used	2	Reported use of the system for the object of study and when it's not used frequently determine the main reasons why
Reasons for not using the system frequently.	12	
Healthcare professional's attitudes		
Perception of the relationship between quality of care and nursing documentation	3 – 4 – 6 – 8	Ascertain the importance given to nursing documentation
Nursing process	5	Ascertain importance given to the nursing process
Perceived benefit for the user	7-9	Perceived benefit in reviewing and interpreting information
Appreciation of content and functionality		
Quality of localized content	13 – 14 – 21	Opinion on the relevance, guidance and overall quality of the care plans available

Usability	10 – 11 – 15 – 16 – 17 – 23	Perceived difficulty in using the system for nursing documentation
Clinical Decision Support (CDS)	18 – 19 – 20 – 22	How the clinical decision support system can be used to streamline the identification of nursing care plan
Sample characterization		
Demographics	24 – 25	Determine the age and extent of professional experience
EHR experience	26 – 27	Determine the experience with the present EHR and level of training
Activity type	28 – 29 – 30 – 31	Determine the area of practice of the respondents which can have an effect on the type of use they make of the system.

Likert-type scales have been widely used in research literature in particular when gauging specific opinions and measuring attitudes. This type of scale allows for measuring personal attitudes along a dimension from negative to positive, a middle point was considered to allow nurses to express a neutral attitude, avoid forcing respondents into expressing positively or negatively when they lack a clear opinion (Jackson & Furnham, 2000). As part of the questionnaire design special consideration was taken in avoiding potential bias associated with the data collection tool. Avoiding double-barrelled questions – that is, questions that contain two attitude objects, quantitative statements – such as by using terms like 'better' or 'always', leading questions – making sure questions were presented from a neutral standpoint and ensuring the answers offered equidistant and neutral distribution of available options. There was also an effort to maintain the questions inquisitive as opposed to ascertain the level of agreement to a statement – in an attempt to reduce the probability of acquiescence bias which is described as the tendency to agree with statements (Boone & Boone, 2012).

Before publishing the survey and circulating across the hospital a pilot testing was performed for a period of 3 days and minor modifications were made following feedback from nursing subject matter experts to which the pilot was circulated.

The questionnaire was made available in an online platform using SurveyGizmo® due to the simplicity of dissemination by circulating a URL via e-mail address through existing nursing and midwifery networks, to all senior sisters across all departments in the hospital requesting to disseminate within their teams. A reminder was then published, 4 days into the survey period, in a trust-wide newsletter that circulates via e-mail daily.

The use of the chosen web-based tool also had the advantage of having the collected data immediately and in an electronic format, enabling faster analysis (Wyatt, 2010). The survey was open for a period of 6 days from the 8th to the 13th of September 2016.

3.4.3. Population and setting

Cambridge University Hospitals (CUH) NHS Foundation Trust is one of the largest hospitals in the United Kingdom with around 1096 beds, it employs around 7626 staff and has 2 principle locations: Addenbrooke's Hospital and Rosie Hospital both located in the same Biomedical Campus. The trust provides a major trauma centre for the east of England and specialist services in a number of areas as well as providing district general hospital services to patients predominantly coming from Cambridgeshire, Essex, Suffolk and Hertfordshire. It is also a government-designated biomedical research centre, an academic health science centre and a university teaching hospital. In the year 2014/15 there were 105,804 attendances to in A&E and a total of 61,400 inpatient admissions (12,361 elective and 41,322 emergency admissions). In terms of staff numbers it employs 2513 nurses, 1142 doctors, and 3971 of other professionals.

On the 26th of October 2014 the Trust went live with a comprehensive electronic patient record (EPR) system – eHospital - using a "big-bang" approach instantly switching on the system across its both sites. One year on, in October 2015, CUH was awarded international accreditation – Stage 6 – from HIMSS (Healthcare Information and Management Systems Society) for its effective use of technology in providing high quality patient care with the introduction of "eHospital". The EPR system uses software by Epic Systems® and it was the first implementation of this vendor in the United Kingdom. Prior to eHospital CUH was a Stage 1 hospital that relied on paper records and with very little integrated digitalisation.

The use of the Epic system allows healthcare providers to enter patient information in one central location and in real time. This integrated system includes medical history, problem list, clinical notes, medication prescribing and administration record, laboratory and radiology ordering and resulting and it covers both inpatient and ambulatory areas of the hospital including emergency department. In particular for nursing documentation the system has been loaded with NANDA-I, NIC (Nursing Interventions Classification) and NOC (Nursing Outcomes Classification) taxonomies to provide researched, evidence-based, support to nursing documentation in care plans.

At go-live and despite all NANDA-I, NIC and NOC taxonomy being available within the EPR forming the bases by which nurses could formulate and evaluate care plans there was no specific content developed or adapted locally. This meant that nurses could utilise any of the 216 NANDA-I diagnoses which would form each care plan template and be presented with all possible goals and intervention packages as determined by the NOC and NIC linkages to NANDA-I (Johnson *et al.*, 2012).

Only a few months after the implementation of the EPR, in end of January 2015, the first care plan templates configured and reviewed by local nursing experts became available to be used. This was both as a reaction to the fact that overwhelming feedback from the nurses in the hospital was that individually configure a care plan for their patients was too time consuming and not very relevant as the identified interventions gave little indication to what in particular was being done for their patients. The locally developed care plan templates were built differently from the content imported. Not only care plan templates were configured for those considered to be the most common identified diagnoses (referred to as problems in the system) and associated outcomes (referred to as goals) already reducing in size when selected to be applied,

the pre-defined interventions listed in these were selected from what is described in the Nursing Intervention Classification taxonomy as activities. The reasoning behind this approach was to facilitate the individualisation of care by listing in the care plans the actual tasks the nurses perform to achieve a targeted outcome.

3.4.4. Participant selection

From a care plan documentation perspective in terms of secondary data it was used a consecutive sample of all patients admitted to the hospital which a length of stay of 24 hours or more over a period of 13 months (from 1st of July 2015 to 31st of July 2016). Consecutive sampling is considered a nonprobability sampling whereby there is no randomisation and involves recruiting all people form an accessible population (Polit & Beck, 2014). The length of period decided was to allow noticing a variation of recorded documentation and to correlate that with the introduction of content and functionality in the EHR. It was possible to extend the retrospective period but at the same time it was intended to analyse the system utilisation with the nurses' opinions and attitudes which only happened in a single point in time.

In order to evaluate the nursing professionals' opinions and reported use of the system, the population was considered all nursing professionals directly involved in assessing, planning and/or implementing and evaluating nursing care of all grades and all specialties. In this case, and due to the size of the population and time constraints it was pondered to utilise a convenience sample or to consider the entire population. In the end the choice was made to include the entire population of nurses in the hospital, knowing the downside of probable low response rate but overall increasing the potential number of respondents.

There strategy followed attempted to mitigate some of the limitations to convenience sampling method which is likely the weakest form of sampling but it is also not surprisingly the most commonly used method in many disciplines due to its advantages in economy and ease. The use of probability sampling may be highly regarded but is often impractical (Polit D. and Beck C. 2014).

3.4.5. Data Analysis

The data collected was analysed in different ways. Data collected from the EHR detailing the care planning documentation done for admitted patients over a period of one year was analysed utilising descriptive statistics. The documentation compliance broken down by area of the hospital and analysed a distribution over time. In terms of the content of care plans (by examination of which care plan templates were utilised) it was again analysed their distribution of time and considered the location of the patient contact.

The data collected from the questionnaire was analysed using IBM®SPSS (*International Business Machines Statistical Package for the Social Science*), version 23 starting by a descriptive analysis using absolute and relative frequencies, measurements of central tendency such as mean and median and measures of dispersion like standard deviation. After that it was performed an analysis of the correlation of factors for an inferential analysis. Since the sample didn't have a normal distribution non-parametric tests were utilised. To evaluate the average difference between two independent samples was used the U-Mann-Whitney (U) test. To evaluate the difference between

three or more independent groups comparing average scores was utilised the Kruskal-Wallis (H) test.

It was also utilised the Spearman's Correlation Coefficient (rho) to study the relationship of variables of similar nature. The Spearman's correlation gives us an indication of both the direction (if positive or negative) and strength of a correlation between variables. A correlation >0.9 indicates a very strong relationship, between 0.7 and 0.9, a strong relationship, between 0.5 and 0.7 a moderate relationship, weak if between 0.3 and 0.5 and very week for a rho <0.3. (Pestana & Gageiro, 2008).

3.5. Ethical Considerations

Data collected during both parts of this study was completely anonymous. Information about patient care plans was only analyzed at high level (at organization or department level) and focused on the terminology used rather than on personalized content. When extracting data from the EHR, no patient identifiable information was used. In the questionnaires distributed only the minimum required information to help characterize the sample was collected.

The principle of self-determination was also ensured as all participants in the questionnaire have voluntarily chosen to participate and for whom a full discloser of the study was given to ensure an informed consent (Polit & Beck, 2014).

To ensure the study complies with various codes of ethics, this study was registered with Safety and Quality Support and approval was granted, given the PRN 4858 (ANNEX 5). After submitting the research proposal and this was considered by the respective research and development department at Cambridge University Hospitals it was considered a service evaluation and there was no need to submit for Regional Ethical Committee opinion.

4. Results

Chapter 4 - Results

This chapter will present the results of the research methods deployed and it's divided into the analysis of the utilization data extracted from the information system and the results of the questionnaire.

Before moving on to present the results it was felt important to clarify a number of terms that may be unique to the setting in which the study has been conducted.

The electronic health record system in use provided by Epic® Systems, being a comprehensive information system that covers all areas of the hospital, is comprised by different modules and within these the clinical users have at their disposal a number of activities that allow them to perform different function such as medication administration, review results, documenting narrative notes, documenting completions of a number of discrete tasks by means of a WorkList, document discrete information in different points in time by means of flowsheets and many others. Although the use of the electronic system is mandatory in all areas of the hospital, the way that the system is use is quite varied across areas of the hospital, some favouring certain workflows and documentation strategies over others. As described in the literature review, documentation of the nursing care plan is part of the Nursing and Midwifery Council (NMC) requirements of good documentation practice but there is no way to mandate its use and certainly no way to mandate that it's done in a particular way in the EHR. When in this study its analyzed the use of care plans its referring to the use of the care plan activity within the EHR and not analyzing the content of the nursing documentation done elsewhere in the system (narrative notes, flowsheets, work list, etc).

Within the care plan activity nurses compose the patient individual care plan by selecting and or modifying care plan templates. A care plan template is a pre-configured base care plan that is based on what nursing diagnose is selected and it suggests a number of pertaining interventions and associated outcomes. As described in chapter 3 when describing the study setting, the system was pre-loaded with all 216 NANDA-I nursing interventions and for each which are available to be selected as templates. There are two methods by which patient can have a care plan assigned, either by the nurses, in the care plan activity, manually search for particular diagnoses and choose from the proposed goals and interventions which ones apply to that particular patient, hereafter described as manually applied, or by accepting best practice advisors (BPAs) that trigger based on documentation done for a particular patient, hereafter described as automatically triggered. Important to say that for those automatically triggered the system does not apply the care plans automatically, the nurse makes a decision to accept or decline the application of the suggested care plan template(s). A limitation of automatically triggered care plans is that by accepting the suggested care plan template through a BPA the template is applied in its entirety which makes it more time consuming for the nurses subsequently modify the applied template to make it individualised for their patients.

When in this study is referred to a presence of care plan is meant that a care plan was applied for the patient episode even if it was then subsequently completed (either by achieving the targeted outcomes and resolving the identified diagnoses or by removing/deleting all elements within the care plan).

Once applied one or more care plan templates, nurses should evaluate the current outcomes (using NOC) and determine the outcomes target that their interventions will try to achieve, at this stage they can also document against particular interventions (using NIC) but the general recommendation is that documentation should be done at goal/outcome level. At the end of this evaluation the nurses automatically file a specific care plan note that gets generated based on the documentation described before each time documentation is done against a goal or intervention. This specific note type can only be created from the care plan activity and is how, in this study, we measure the care plan being documented.

It was also felt important to verify the uniformity of the care plan documentation utilization and for that reason the various hospital locations were organized in 7 generic categories – Adult Medicine (covering all medical adult specialities), Adult Surgery (covering all adult surgical specialities), Paediatrics (combining both medical and surgical paediatric services), Oncology (covering all cancer related services), Obstetrics (including maternity), Theatres (including endoscopy and procedural areas) and Intensive Care Areas (including various ITUs and HDUs).

4.1. Care plan utilisation

In order to answer the research question: 'How much are nurses using the care plan activity" within the HER, different reports were configured in order to extract data utilisation from the system as described in chapter 3.

There were in total 42667 inpatient encounters that matched the criteria of the reports during the period of retrospective analysis, with an average of 3282 admissions per month. The vast majority of which (42.41%, n= 18096) occurred in adult medical areas, followed adult surgery areas (21.63%, n= 9227), with obstetrics being the area with least expression (1.48%, n=630), overall distribution detailed Fig. 2. The overall percentage observed of patient with at least one care plan applied for this period was of 96.96%.

The total percentages of patients with care plan when distributed per location didn't show much variation with Theatre areas showing the smallest observed percentage (88.64%), followed by Obstetrics (96.98%), Adult Surgery (97.97%), Paediatrics (98.57%), Adult Medicine (99.17%), Oncology (98.18) and Intensive Care / High Dependency Units observing the highest percentage overall with 99.56%.

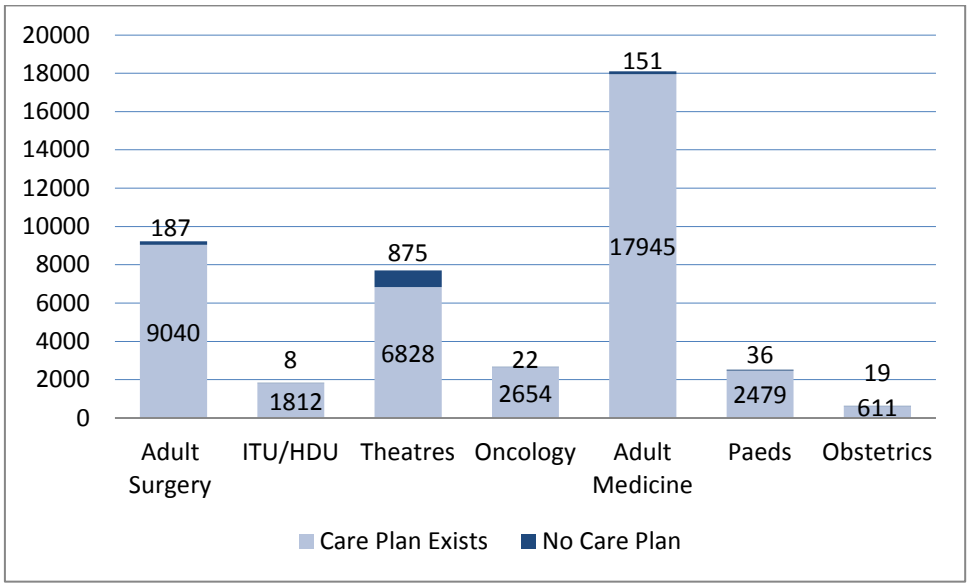


Figure 2 – Distribution of admissions and if whether care plan exist

One of the objectives was to verify the progression of the utilisation of care plans over time and Table 3 shows that distribution. There is an evident increase of the overall percentages of admitted patients with care plan present from an initial 94.38% observed in Jul 2015 to 98.71% observed one year later, across most areas, but more pronounced in Adult Surgery (from 93.73% to 99.22%), areas like ITU/HDU (100%, unchanged), Obstetrics (95.83% to 95.12%) and Paediatrics (99.45% to 99.19%) showed little variation from month to month.

Table 3 – Distribution of care plan presence per month from Jul 15 until Jul 16.

	Total			Adult Surgery			ITU/HDU			Theatres		
	N with Care Plan	N Without Care Plan	**% of care plan presence**	N with Care Plan	N Without Care Plan	**% of care plan presence**	N with Care Plan	N Without Care Plan	**% of care plan presence**	N with Care Plan	N Without Care Plan	**% of care plan presence**
Jul-15	2822	168	**94.38%**	628	42	**93.73%**	88	0	**100.00%**	494	84	**85.47%**
Aug-15	2567	145	**94.65%**	584	34	**94.50%**	86	1	**98.85%**	413	78	**84.11%**
Sep-15	2909	161	**94.76%**	598	26	**95.83%**	118	1	**99.16%**	471	87	**84.41%**
Oct-15	2966	100	**96.74%**	578	9	**98.47%**	157	1	**99.37%**	511	78	**86.76%**
Nov-15	2833	88	**96.99%**	585	8	**98.65%**	126	2	**98.44%**	508	69	**88.04%**
Dec-15	2946	85	**97.20%**	613	11	**98.24%**	129	0	**100.00%**	517	65	**88.83%**
Jan-16	3078	74	**97.65%**	683	6	**99.13%**	153	0	**100.00%**	466	62	**88.26%**
Feb-16	2879	67	**97.73%**	609	7	**98.86%**	133	1	**99.25%**	463	53	**89.73%**
Mar-16	3046	83	**97.35%**	678	8	**98.83%**	139	0	**100.00%**	491	66	**88.15%**
Apr-16	2823	76	**97.38%**	668	9	**98.67%**	135	1	**99.26%**	434	60	**87.85%**
May-16	3019	92	**97.04%**	694	8	**98.86%**	125	1	**99.21%**	475	66	**87.80%**
Jun-16	3343	79	**97.69%**	719	8	**98.90%**	158	0	**100.00%**	537	55	**90.71%**
Jul-16	6138	80	**98.71%**	1403	11	**99.22%**	265	0	**100.00%**	1048	52	**95.27%**

	Oncology			Adult Medicine			Paediatrics			Obstetrics		
	N with Care Plan	N Without Care Plan	**% of care plan presence**	N with Care Plan	N Without Care Plan	**% of care plan presence**	N with Care Plan	N Without Care Plan	**% of care plan presence**	N with Care Plan	N Without Care Plan	**% of care plan presence**
Jul-15	224	8	**96.55%**	1162	31	**97.40%**	180	1	**99.45%**	46	2	**95.83%**
Aug-15	185	4	**97.88%**	1091	21	**98.11%**	158	6	**96.34%**	50	1	**98.04%**
Sep-15	161	5	**96.99%**	1349	38	**97.26%**	168	4	**97.67%**	44	0	**100.00%**
Oct-15	168	0	**100.00%**	1332	7	**99.48%**	176	3	**98.32%**	44	2	**95.65%**
Nov-15	169	0	**100.00%**	1246	5	**99.60%**	156	1	**99.36%**	43	3	**93.48%**
Dec-15	194	1	**99.49%**	1260	3	**99.76%**	188	4	**97.92%**	45	1	**97.83%**
Jan-16	212	0	**100.00%**	1359	2	**99.85%**	175	2	**98.87%**	30	2	**93.75%**
Feb-16	189	0	**100.00%**	1262	4	**99.68%**	168	0	**100.00%**	55	2	**96.49%**
Mar-16	202	1	**99.51%**	1321	5	**99.62%**	182	3	**98.38%**	33	0	**100.00%**
Apr-16	194	1	**99.49%**	1169	4	**99.66%**	173	1	**99.43%**	50	0	**100.00%**
May-16	176	0	**100.00%**	1293	12	**99.08%**	221	4	**98.22%**	35	1	**97.22%**
Jun-16	182	1	**99.45%**	1486	10	**99.33%**	203	4	**98.07%**	58	1	**98.31%**
Jul-16	398	1	**99.75%**	2615	9	**99.66%**	331	3	**99.10%**	78	4	**95.12%**

As per the methodology examined in chapter 3, it was considered a secondary indicator of care plan utilisation whether or not the identified care plans were being documented on by

considering n the total number of days each patient remained in hospital for which a care plan template was active (not completed or resolved). The total number of days combined was 297,597 with an average of 22,892 days per month. Fig 3. represents the absolute values distributed by services, considering the percentage distribution we verify that vast majority (52.6%) occurred in adult medical areas, followed by adult surgery areas (25.9%), with theatres being the area with least expression (0.51. The overall percentage observed of inpatient days for which the care plan was documented was of 0.124%.

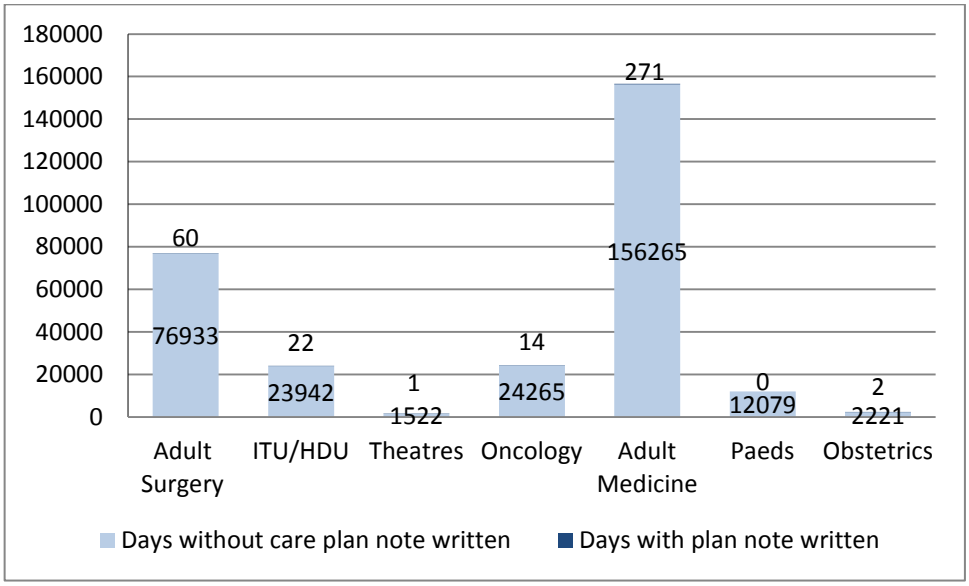


Figure 3. - Distribution of admissions days and whether a care plan note as been written

Similarly to the distribution reported for the number of care plan templates, it was also felt important to analyse the progression of the care plan documentation (ANNEX 2). It doesn't seem to be a clear progression, since the total percentage from July 2015 (0.13%) is only topped by those of January (0.14%), February (0.14%), June (0.19%) and July 2016 where there was a significant increase (to 0.71%). Areas like Adult Surgery, Theatres, Obstetrics and Paediatrics have consistently very low numbers during the entire period with only 3 days (n=3) in which a patient in those areas have had one (or more) care plan note written. Adult Medicine and ITU/HDU are the only areas where it seems to have been an increase on frequency of care plan documentation with the percentage of days in which care plan note(s) have been written increased from 0.14% and 0.00% to 1.06% and 0.86% respectively.

Another metric retrieved from the EHR as described in the methodology section was the total count of care plan templates. This was broken down by each calendar month to allow distribution analysis in similar ways as the previous reports.

This report showed a clear increase over the time period of the total count of care plan templates applied per calendar month. Started in 7,739 care plan templates used in July 2015 and steadily increasing almost month by month, the highest number observed in July 2016 with a total of 29,198 care plan templates applied (ANNEX 3)

The abrupt increases of care plan utilisation verified for 'Discharge Care', 'Risk for Falls', 'Essential Care', 'Sepsis', 'Peripheral Venous Access', 'Central Venous Access', 'Diarrhoea', 'Nutrition', 'Acute Pain', 'Wound Care', 'Restricted Mobility', 'Specialling', 'Nausea', 'Constipation', and 'Safeguarding' coincide with the release of these care plans into the live system and changes to the criteria that suggests these care plans as per Table 4.

Table 4 – Changes to Care Plan Templates and BPAs during the period in analysis

	Date content made available:
***New care plan templates:**	
85-Discharge Care	Sep-15
50-Risk for Falls	Aug-15
41-Essential Care (adults)	Nov-15
39-Sepsis (Adults)	Nov-15
43-Essential Care (Paediatrics)	Nov-15
45-Peripheral Venous Access	Dec-15
46-Central Venous Access	Dec-15
47-Diarrhoea	Dec-15
48-Nutrition	Dec-15
51-Acute Pain	Dec-15
54-Wound Care	Dec-15
55-Restricted Mobility	Dec-15
49-Specialling	Mar-16
52-Nausea	Mar-16
53-Constipation	Mar-16
42-Sepsis (Paediatrics)	Mar-16
57-Safeguarding	Mar-16
****BPA criteria modified:**	
50-Risk for Falls	Mar-16

The patient location (department) was also grouped in a similar fashion as the two previous reports, as per Table 5. All areas showed an increase of care plan templates applied and the biggest absolute increase was noticed in Adult Medicine (from 3,442 in Jul 15 to 14,337 in Jul 16) and Adult Surgery (from 2,052 to 7,540 in equal periods). All areas showed a significant increase in particular from the July 2015 to January 2016 remaining more or less stable from there on, the exception being the paediatric areas that peaked the care plan use in January 2016 (with n=1,317) observing a decline after that with only 885 care plan templates utilised in July 2016.

Table 5 – Distribution of total care plan templates count per area

Area	Calendar Month												
	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16
Adult Medicine	3442	3565	4114	5457	5560	9242	12235	10440	12227	12759	13785	12775	14337
Adult Surgery	2052	1971	2125	2965	3202	4952	7226	6108	7050	7826	7126	7633	7540
Oncology	577	469	523	826	793	1447	1859	1356	1910	1690	1823	2104	1969
Obstetrics	688	764	743	753	793	1153	1928	1554	1776	1594	1628	1738	1753
Paeds	392	481	510	532	522	891	1317	1075	1221	1241	1133	924	885
ITU/HDU	467	440	541	617	653	1299	1696	1374	1774	1670	2050	1746	2002
Theatres	68	66	64	100	94	235	591	553	598	536	554	588	505
Other	53	89	89	76	72	142	257	260	284	268	186	267	207
Total	7739	7845	8709	11326	11689	19361	27109	22720	26840	27584	28285	27775	29198

Before moving on to the second part of the study were the answers to the questionnaire will be analysed is important to spare some considerations on what was observed thus far.

It was noted that the vast majority of patients do have nursing care plans identified and there has been an increase of this percentage across the hospital. That increase in percentage is accompanied by an increase in number of care plan templates utilised which indicates an increase in completeness of documentation and in the application of the nursing process by increase on the utilization of a larger variety of nursing diagnoses. This is corroborated by examples in the literature discussed in chapter 2 (Currel & Urquhart, 2003; Mahler et al., 2007; Thoroddsen *et al.*, 2011) that associate the introduction of electronic health records and standardised care plans as resulting in increasing quality and completeness of nursing documentation.

On the other hand, this increase was not followed by an increase in the evaluation of the care plan, in what is considered to be care planning documentation. In fact it was observed that a care plan evaluation note is written on average for less than 1% of the days someone is admitted to the hospital. Analyzing the distribution per hospital locations it was observed an ever so slight bigger percentage for those admissions to adult medicine and oncology areas. This lack of correlation can be seen as opposed to the finding of Mahler and collaborators (2007) on the other hand Larrabee and collaborators (2001) also only observed improvement of the nursing documentation after 18 months and only after retraining of nurses.

The number of care plan templates utilised in the system may also be explained by the clinical decision support systems in place that makes it easy to apply a care plan template (one or two clicks in most cases) that suggest application of care plan templates based on documentation existing for that patient.

Further in this thesis will be explored how the nurses perceive their documentation of the patient care plan to be and some of the reasons for the low compliance of the evaluation documentation.

4.2. Questionnaire

The instrument selected to ascertain the nurse's perceptions and attitudes towards care planning documentation and their perceived use was described in chapter 3 of this dissertation.

The questionnaire was circulated via internal e-mail sent to ward managers, divisional nurses and practice development leads asking to disseminate within the clinical areas. The total number of nurses in the hospital is 2,513 and estimate that about 1,400 work primarily in inpatient areas, there was no indication on the permeability of the e-mail circulated but for the purpose of this study it was considered n=1,400 as the targeted population. After 6 days a total of 137 completed questionnaires were received (9.78%) which albeit being a low response rate was considered adequate for the present analysis.

4.2.1 Validity of the questionnaire

Internal validity looks at the internal consistency of items within a scale is often done using the Cronbach's alpha. A Cronbach's alpha of 0.7 or above can be considered adequate. According to Pestana and collaborators (2005) the internal consistency of an instrument is considered to be "very good" if the Cronbach's alpha is greater than 0.9; "good" for a Cronbach's alpha between 0.8 and 0.9; "reasonable" for a Cronbach's alpha between 0.7 and 0.8; "weak if the Cronbach's alpha is between 0.6 and 0.7 and "mediocre" for an alpha less than 0.6.

The Cronbach's alpha for the questionnaire utilised in this study was initially, considering all the suitable items of the questionnaire of 0.659 which would be considered weak noticing that the value didn't increase with the removal of any of the items (ANNEX 4).

It was observed the Cronbach's alpha only for items composing variables for perceives benefits, content and usability was much improved, of 0.862 (Table 6), noticing that the value didn't increase with the removal of any of the items. This verifies that there is a correlation between all the items, which validates the theoretical construction adding value to the instrument internal consistency.

Table 6 - Cronbach's alpha for the combined variables

Questionnaire item:	Scale Mean if item deleted	Scale variance if item deleted	Corrected item - total correlation	Square multiple correlation	Cronbach's alpha if item deleted
3	17.28	81.299	.423	.470	.860
4	17.47	77.388	.641	.686	.846
5	16.42	85.593	.409	.245	.859
6	17.55	83.745	.433	.254	.858
13	17.54	78.125	.715	.673	.842
14	17.99	77.947	.461	.406	.860
21	18.69	86.659	.156	.394	.880
10	21.31	77.754	.707	.728	.842
11	21.13	78.532	.631	.700	.847
15	20.74	77.500	.636	.555	.846
16	21.05	79.481	.651	.553	.846
17	21.20	81.339	.579	.563	.850
23	21.14	79.992	.662	.629	.846

In order to decide between parametric or non-parametric statistic for inferential analysis, it was studied the distribution of our sample, using the Kolmogorov-Smirnov (K-S), observing the existence of results with a statistic significance of $\rho < 0.001$ in all of the items, meaning that our sample didn't had a normal distribution.

In order to compare the average differences between independent groups, the Kruskal-Wallis (H) test was performed to Before proceeding with Kruskal-Wallis test, first we used IMB SPSS ® to check if the distribution assumption was violated.

4.2.2. Descriptive statistics

The average age of the respondents was of 36.6 years (SD 9.4), with a mean number of years of nursing experience being 11.43 (SD 8.0). In terms of experience within the hospital and therefore with the use of the electronic health record the reported mean was of 17.38 months (SD 6.9) with 50% having 20 months of experience within the existing EHR and only 12,7% reported 6 months or less of experience with this. 86.9 % (n=119) reported spending more than 50% of their time delivering direct patient care and 76.6% (n=105) reported working in more than 50% of their time in inpatient areas. Most respondents (77.4%) selected Adult Nursing as an area that best described their practice (n=106), followed by Intensive Care (12.4%, n=17), Oncology (7.3%, n=10) 5.8 % selected Paediatrics (n=8), Research (5.1%, n=7), only 5 respondents selected Maternity/Midwifery (3.6%). In terms of nursing band (career progression point), 44.5% identified themselves as Band 5 nurses (n=61), 33.6 % as Band 6 (n=46), 18.2% Band 7 (n=25) and 1.5% (n=2) as Band 8 or above, with 3 of the respondents choosing not to answer.

In relation to having had specific training about the use of care plan activity within the EHR 31.4% (n=43) stated having had it during their initial training (which covered most of the functionalities of the EHR), 26.3% (n=36) stated having attended a care planning master class (1 hour session dedicated to nursing care planning in the electronic system), 29.9% (n=41) declared

not having had any training on this functionality and 12.4% (n=17) don't know or don't remember.

The overall reported used of the system was ascertained in a single question: 'how often do you use the care planning activity in Epic?' with a 5 point Likert-like scale for the possible answers ('Never use', 'Almost Never', 'Occasionally/Sometimes', 'Almost every shift' or 'At least once per shift'). 24.8 % (n=34) of the respondents declared that never use it, 25.5% (n=35) stated 'almost never', 12.4% (n=17) stated using this almost every shift whilst 18.2% (n=25) stated to use the care plan activity 'At least once per shift'. Those respondents that selected never using the system didn't get presented with items in the questionnaire developed to ascertain user's appreciation of existing content and functionality. On the other hand, only those that haven't indicated to use the system very often- by not selecting 'Almost every shift' or 'At least once per shift' (84%, n=95) were prompted to indicate the reasons for not using the care planning activity within the EHR.

To capture those reasons a multiple choice item in the questionnaire listed a number of potential reasons, leaving also the opportunity for the respondents to select other and free text additional options. The most common reasons identified for not using the care planning functionality (see Table 7 were related to the extension of the available care plans (n=62), lack of time (n=57), difficulty in use (n=52) and lack of training (n=47). Some expressed concerns over the quantitative assessment (n=31), the lack of computers/workstations (n=21) or that the other members of the multidisciplinary team would not have visibility of their documentation (n=19) and with the language/terminology used (n=15). Some also indicated they don't see care planning documentation as necessary (n=11) or that not having enough content (available care plan templates to choose from) as a reason for not using it more frequently (n=10).

Table 7 – Main reasons indicated for not frequently using the care plan activity

	n	% valid (n/95)	% of total (n/137)
Available content too lengthy	62	65.3%	45.3%
Takes too much time	57	60.0%	41.6%
Find it difficult to use	52	54.7%	38.0%
Lack of training	47	49.5%	34.3%
Other	35	36.8%	25.5%
Difficult to use quantitative measurement	31	32.6%	22.6%
Not enough computers/workstation	21	22.1%	15.3%
Not visible to other professionals	19	20.0%	13.9%
Language/terminology	15	15.8%	10.9%
Don't think it's necessary	11	11.6%	8.0%
Not enough content (care plan templates)	10	10.5%	7.3%
Not mandatory	8	8.4%	5.8%

A content analysis was performed to the total answers given under 'Other' for this item (n=31) and the main additional reasons appointed were not finding that care planning applied to their practice areas (n=11) mentioned 'maternity', 'emergency department', 'outpatient areas' or simply by saying that there isn't content available to their specific area. Other reasons listed were concerns over care plan content (n=6), capturing statements like 'too generic or too long', '6-8

care plans for an average ward nurse is impossible and mostly irrelevant' , alluding to duplication of documentation (n=5), difficulties in using an electronic format, using alternative functionality or concerns over individualisation of care were other appointed reasons (each with 3 occurrences).

4.3 Inferential Statistics

For the purpose of inferential statistical analysis the following questionnaire items were grouped together according to their intended purpose, creating variables for Perceived Benefits, Content, and Usability. For that new variables were created based on the average scores of the individual items, removing null values.

In order to construct the variable for perceived benefits, the scores of questionnaire items 3, 4, 5 and 6 were combined as shown in Table 8. The results corresponding to this construct showed a combined mean of 3.46 (± 1.02 SD) and median of 3.5 which indicates a positive opinion regarding the benefits of care planning documentation. The highest impact being the importance given to identify nursing diagnosis considered to be 'Very Important' by 54.7% of the respondents with a weighted mean of 4.26 (± 1.03 SD).

Table 8 – Distribution of answers for variables grouped under perceived benefits

Variables	n responses (and %) and weighted values					**Mean (± SD)**	**Median**
Perceived Benefits	1 *(Not at all influential)*	2 *(Slight Influential)*	3 *(Somewhat Influential)*	4 *(Very influential)*	5 *(Extremely influential)*		
3- What do you consider to be the influence of the nursing documentation on the quality of care provided?	26 (19%)	17 (2.4%)	22 (16.1%)	17 (12.4%)	34 (24.8%)	3.29 (±1.47)	4
6- What do you consider to be the influence of the quality of nursing care provided on the quality of the documentation produced?	10 (7.3%)	30 (21.9%)	40 (29.2%)	33 (24.1%)	21 (15.3%)	3.19 (±1.17)	3
	(Very low)	(Low)	(Moderate)	(High)	(Very high)		
4- How would you rate the impact the care plan documentation has on the individualisation of care?	22 (16.1%)	28 (20.4%)	22 (16.1%)	37 (27.0%)	28 (20.4%)	3.15 (± 1.39)	3
	(Not important)	*(Slightly Important)*	*(Moderately important)*	*(Important)*	*(Very Important)*		
5- How important do you consider it to document identified patient problems / nursing diagnoses?	5 (3.6%)	5 (3.6%)	14 (10.2%)	38 (27.7%)	75 (54.7%)	4.26 (±1.03)	5

The variable for content uses the scores of questionnaire items 13, 14 and 21 combined as shown in Table 9. The results corresponding to this construct showed a combined mean of 2.05 (±1.47 SD) and median of 2.0 which indicates a negative opinion regarding the care plan content available within the EHR. Despite the majority considering that the care plans reflected the care

provided to a reasonable extent (n=31, 22.6%) with a weighted mean of 3.29, both in terms of guidance offered by care plans and quality of the content of the care plans in the system, the opinion of the respondents was slightly negative.

Table 9 – Distribution of answers for variables grouped under opinion of content

Variables	**n responses (and %) and weighted values**					**Mean (± SD)**	**Median**
	1	2	3	4	5		
Content	*(Not at all)*	*(very little)*	*(Somwhat)*	*(To a reasonable extent)*	*(Almost always)*		
13- To what extent do you consider the care plan documentation to reflect the actual care that you provide to your patients?	6 (4.4%)	21 (15.3%)	29 (21.2%)	31 (22.6%)	16 (11.7%)	3.29 (±1.13)	3
	(Never)	*(Rarely)*	*(Occasionally)*	*(A moderate amount)*	*(A great deal(*		
14- How much guidance and support do you consider the CUH care plans available in Epic offer to yourself or colleagues on how to address particular patient identified problems / nursing diagnosis?	4 (2.9%)	27 (19.7%)	13 (9.5%)	27 (19.7%)	17 (12.4%)	2.87 (±1.59)	3
	(Very poor)	*(Poor)*	*(acceptable)*	*(Good)*	*(Very Good)*		
15- Focusing on care plans configured specifically for CUH (prefixed by CUH when you apply a new template or accept a suggested care plan via a BPA), how do you rate the quality of their content?	6 (4.4%)	17 (12.4%)	37 (27.0%)	11 (8.0%)	4 (2.9%)	2.15 (±1.49)	0

The variable for usability was constructed combining the average scored of questionnaire items 10, 11, 15, 16, 17 and 23 as shown in Table 10. The results corresponding to this construct showed a combined mean of -0.25 (±.80 SD) and median of -.33 which indicates a slight negative opinion regarding usability of the care planning activity, although close to a neutral position. The item with more negative expression being the review of nursing evaluation of patient progress (item 17) that most respondents considered either difficult (39.4%) or very difficult (22.6%), this item showing a weighted mean of -0.61. All other items in this group, although with less intensity, are also positioned in the negative spectrum.

Table 10 – Distribution of answers for variables grouped under opinion of usability

Variables	n responses (and %) and weighted values					**Mean (± SD)**	**Median**
	-2	**-1**	**0**	**1**	**2**		
Usability	*(very difficult)*	*(Difficult)*	*(Neutral)*	*(Easy)*	*(Very easy)*		
10- How would you describe the difficulty of reviewing the nursing evaluation of patient progress from the nursing care plan?	31 (22.6%)	54 (39.4%)	26 (19.0%)	17 (12.4%)	8 (5.8%)	-.61(±1.14)	-1
11- How would you describe the difficulty in finding the care that is planned for your patients in the electronic patient record?	27 (19.7%)	39 (28.5%)	33 (24.1%)	25 (18.2%)	12 (8.8%)	-.32 (1.23)	0
16- Do you think that prescribing nursing interventions in the care plan activity is:	14 (10.2%)	24 (17.5%)	43 (31.4%)	24 (17.5%)	8 (5.8%)	-.23 (1.09)	0
17- Do you think that evaluating the result of nursing care by selecting an outcome rating in the care plan activity is:	17 (12.4%)	24 (17.5%)	41 (29.9%)	17 (12.4%)	4 (2.9%)	-.32 (1.16)	0
23- How difficult / easy do you consider to be individualizing the care plan for your patients using the care plan activity in Epic?	18 (13.1%)	18 (13.1%)	46 (33.6%)	18 (13.1%)	3 (2.2%)	-.29 (1.04)	0
	(Strongly disagree)	*(Disagree)*	*(Neither agree or disagree)*	*(Agree)*	*(Strongly agree)*		
15- How much do you agree or disagree with the following statement: "I consider the nursing interventions for each identified patient problem to be clearly documented in the care plan"?	11 (8.0%)	26 (19.0%)	22 (16.1%)	28 (20.4%)	11 (8.0%)	-.29 (1.04)	0

As described in Chapter 3 it was intended to analyse the relationship between different variables by calculating the Spearman's correlation coefficient (rho) when those variables were of the same nature. Table 11 shows the correlation matrix between the three constructed variables where it can be observed a positive correlation between the identified constructs, validating the theoretical conception of the instrument. The observed correlation is overall weak correlation between the grouped variables, the strongest observer being 'perceived benefits' and 'content' (rho of .401)

Table 11 Spearman's Correlation between Perceived Benefits, Content and Usability

			Perceived Benefits	Content	Usability
Spearman's rho	Perceived Benefits	Correlation Coefficient	1.000		
		Sig. (2-tailed)			
		N	137		
	Content	Correlation Coefficient	,401**	1.000	
		Sig. (2-tailed)	.000		
		N	137	137	
	Usability	Correlation Coefficient	,373**	,244**	1.000
		Sig. (2-tailed)	.000	.004	
		N	137	137	137

**. Correlation is significant at the 0.01 level (2-tailed)

A positive Spearman's correlation coefficient represents a positive linear relationship, indicating that, in average, the increase of one variable represents an increase on the other.

In general the correlation between respondents nursing experience or experience with the electronic health record and the variables perceived benefits, content and usability was weak or very weak

Table 12 illustrates the observed moderate positive correlation between the perceived benefits and the importance attributed to the identification of nursing diagnoses (rho of .607) – item 5 in the questionnaire – and between the opinion of the content of the care plans available in the system and the frequency of use of the care planning module within the EHR (rho of .680) – item 2 in the questionnaire. As for the remaining results all indicate positive correlation although weak (0.3 -0.5) between item 2 and usability and perceived benefits and between item 5 and content and very weak between item 5 and usability and item 5 with item 2.

Table 12 – Spearman's Correlation of grouped variables with perceived use and importance given to the nursing diagnoses

				Content	Usability	2 - How often do you use the care planning activity in Epic?	5- How important do you consider it to document identified patient problems / nursing diagnoses?
Spearman's rho	Perceived Benefits	Correlation Coefficient	1				
		Sig. (2-tailed)					
		N	137				
	Content	Correlation Coefficient	,401**	1.000			
		Sig. (2-tailed)	.000				
		N	137	137			
	Usability	Correlation Coefficient	,373**	,244**	1.000		
		Sig. (2-tailed)	.000	.004			
		N	137	137	137		
	2) How often do you use the care planning activity in Epic?	Correlation Coefficient	,342**	**,680****	,305**	1	
		Sig. (2-tailed)	.000	**.000**	.000		
		N	137	**137**	137	137	
	5) How important do you consider it to document identified patient problems / nursing diagnoses?	Correlation Coefficient	**,607****	,302**	,238**	,290**	1
		Sig. (2-tailed)	**.000**	.000	.005	.001	
		N	**137**	137	137	137	137

**. Correlation is significant at the 0.01 level (2-tailed)

The other moderate correlation was observed with the variables of agreement with care plans that are suggested by the clinical decision support system and the level of support for such mechanisms (rho of 0.401). Week (.373) or very week (.244) positive correlations were observed in relation to the other decision support directed items as per Table 13.

Table13 – Spearman's correlation between in relation to the Clinical Decision Support

			How much do you support or oppose to care plans being automatically suggest based on existing documentation?	In general, how much do you agree with the care plan templates that are automatically suggested to you?	When you see a BPA (Best Practice Advisory) suggesting a certain care plan template to be added to your patient's care plan, how frequently would say it's clear to you why that care plan is being suggested?
Spearman's rho	How much do you support or oppose to care plans being automatically suggest based on existing documentation?	Correlation Coefficient	1.000		
		Sig. (2-tailed)			
		N	137		
	In general, how much do you agree with the care plan templates that are automatically suggested to you?	Correlation Coefficient	,401**	1.000	
		Sig. (2-tailed)	.000		
		N	137	137	
	When you see a BPA (Best Practice Advisory) suggesting a certain care plan template to be added to your patient's care plan, how frequently would say it's clear to you why that care plan is being suggested?	Correlation Coefficient	,373**	,244**	1.000
		Sig. (2-tailed)	.000	.004	
		N	137	137	137

**. Correlation is significant at the 0.01 level (2-tailed)

Once determined that our sample didn't have a normal distribution, the Kruskal-Wallis test was used to compare the average differences between three or more groups.

This analysis determined that only the 'perceived benefits', experience with EHR – item 26 – and importance of nursing diagnoses – item 5 – could be compared with the level of training of the care planning module – item 27. It was also possible to compare the reported level of use – item 2 – with the nursing band – item 31 in the questionnaire.

Out of the possible comparisons of distributions the ones that were felt to be more important to consider were the relationship between training and perceived benefits and the comparison between the reported used of the system and nursing grade.

Fig 4 shows a boxplot the Kruskal-Wallis test comparing the answers regarding presence of previous training with the care planning module and the constructed variable for perceived benefits. There is statistically significant variance observed, the medians of those that had training in alongside the initial Epic training and those that didn't is positioned similarly in the scale of perceived benefits (X^2_{KW} =10,18;gl=3; n=137; p=0,01) .

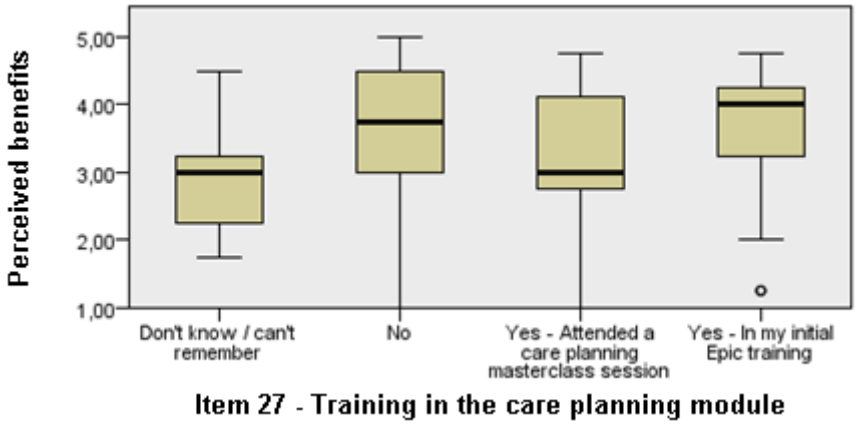


Figure 4 Kruskal-Wallis Test for perceived benefits and item 27

As for the distribution comparison between the nursing band – item 31 – and the reported use of the care planning in the EHR – item 2 – (Fig 5), curiously, the significance observed of those that report use more the care planning functionality were those that failed to identify which band of nursing they are which doesn't allow much conclusions. That aside, we can observe that band 5 and band 6 make equally use of the care planning functionality and more than band 7 and band 8 or above (X^2_{KW} =11,55;gl=4; n=137; p=0,02).

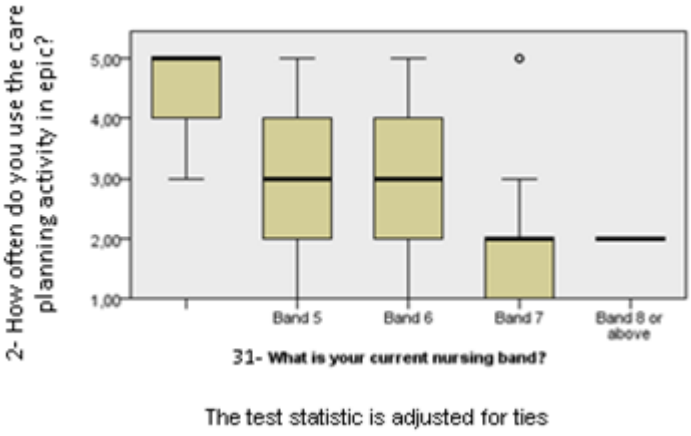


Figure 5 – Kruskal-Wallis test for item 2 and 31

The comparison between the reported use of the system and the training on the care planning activity showed statistically significant differences (X^2_{KW} =20.201;gl=3; n=137; p=0,000). Being the average use significantly lower for those without or not recalling having had training on the care planning module (Fig 6)

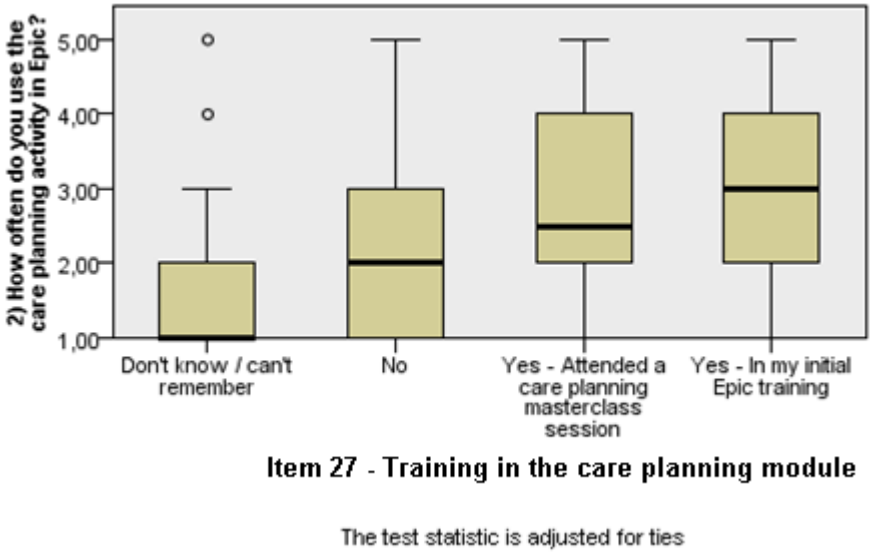


Table table – Kruskal-Wallis test for item 2 and 27.

There was also an attempt to verify if there were differences statistically significant between items 28 (Does your current role involve frequent direct care?) and 2 (how often the care planning activity is used in the EHR) and the variables for 'perceived benefits' and 'content'. We expected to see those that directly look after patient to use more of the care planning activity and potentially recognize value in terms of benefits for them and for their patients and were curious about the impact in the opinions about available content.

Since these were independent values it was used the Mann-Whitney (U) test and there weren't observed differences statistically significant between those items:

- Item 2 and 28 (U=735,5; W=8116,5; p=0,11; Mean Rank: No=85,53; Yes=67,08);
- Item 28 and the constructed variable for perceived benefits (U=803; W=8184; p=0,26; Mean Rank: No=79,31; Yes=67,64);
- Item 28 and the constructed variable for appreciation of the content available (U=997,5; W=8378,5; p=0,84; Mean Rank: No=67,16; Yes=69,24).

5. Discussion

Chapter 5 - Discussion

This chapter discusses the findings following the data collection outlined in the research methodology. Putting together the two phases of the study and analyse how it answered the research questions.

The purpose of this study was to evaluate the care planning documentation using the electronic health record and explore the relation between nurses' (as end users) reported utilization of the care planning module in the system and perceptions and attitudes towards care planning.

When addressing the question: 'how much the care plans are being utilised in the system?' this research found inconsistent metrics. In one hand it was found that a high percentage of admitted patients have at least one nursing care plan identified. Moreover analysing the evolution of documentation done over the last 12 months, the number and variety of care plans utilised as been steadily increasing. When comparing the number of care plan templates and the number of admitted patients for equal periods that the number of templates per patient has been increasing, the average of care plans per patient on the first 4 months of the data collection period was of 3.16, whilst the average of the last 4 months was of 7.36 care plan templates per patient. This was in line of other studies referred to in the chapter 3 of this thesis where it was discussed the existing evidence of the introduction of electronic documentation systems as resulting in increased completeness of documentation (Currel & Urquhart, 2003; Mahler *et al.*, 2007; Thoroddsen *et al.*, 2011). On the other, that there were an insignificant percentage of care plans actually being evaluated or documented on following formulation of the plan.

The increasing number of utilisation of care plan templates almost as soon as these were released in the system seems highly likely to be attributed to the associated decision support mechanism that facilitated the identification of patient-specific care plan templates based on documentation existing on that patient chart.

This method of applying a care plan to the patient is simplified and doesn't require much thinking process from the nursing staff. This is in fact one of the disadvantages found in the literature in regards to the utilisation of standardised care plans (Lee *et al.*, 2002; Mahler *et al.*, 2007). Answers to the questionnaire also demonstrated a positive perception in relation to the use of clinical decision support.

The small percentage of documentation following the application of a care plan can be seen as a sign of low adoption of the information system as discussed in chapter 3 when introducing the D&M IS success model. There are a number of factors described in the literature that affect the success o a change process (Lee, 2004; Moody *et al.*, 2004). Some of the findings from reviewing the literature helped the construction of the questionnaire aiming to evaluate them in the setting of this study. This also contributed to the formulation of the second research question: what are the nurses' perceptions and attitudes towards benefits, content and usability of system?

Starting by the characterisation of our sample we verified that the level of training specific to the use of the care planning module had only happened to circa 60% of the respondents. The comparison of this data and the reported use of the system we verified a strong variation. Those users that had specific training in using the functionality, even when it happened in context of generic teaching session about the electronic health record system, reported to use more of the

care planning than those that didn't had training or don't remember having had. In fact the group that least reports using the care plan activity is the one that doesn't remember. This was in line with findings of literature in particular the study conducted by Mahler and collaborators (2007) only started seeing changes in the uptake of the nursing care planning documentation after 18 months after the EHR implementation and only after significant training programme. Training is, obviously a major part of change process management in particular in introducing a complete new way of working so it's not at all surprising the strong correlation found. There wasn't, though, a significant correlation between level and training and perceived benefits of the system.

We observed in this study that nurses' perceptions of the benefits of care planning documentation were overall positive with a mean of 3.46 (± 1.02 SD) and median of 3.5. The opinions about content were, however, on average negative, with mean of 2.05 (±1.47 SD) and median of 2.0 and so where the opinions regarding usability of the care plan activity with a mean of -.25 (±.80 SD) and median of -0.33, although close to a neutral position.

These findings again aren't surprising in light of the findings regarding the levels of documentation observed on existing care plans in the system. In fact, considering the low active utilisation observed and a somewhat recent disruption caused by the introducing of the EHR and the nursing taxonomies that all three concepts would show a negative perception. That would be in line with findings from Kahouei and collaborators (2014) where 1 year of rolling out an EHR to an Iran hospital nurses' perceptions of the information system were overall negatives.

Statistical analysis showed that the constructed variables of 'Perceived benefits', 'Content' and 'Usability' had a positive linear correlation. There was moderate positive correlation between the perceived benefits and the importance of identification of nursing diagnosis (rho .607) which should favour the utilisation of the nursing process.

It was interesting to see that although a majority of the respondents declared not using the care planning very frequently (50.3%) one would expect that value to be higher looking at the actual metrics of system utilisation. This discrepancy could be explained by a time difference between when the questionnaire was circulated (8th Sept 2016 to 13th Sept 2016) and the data collection period (1st July 2015 to 31st July 2016), although looking at the slow increase of the care plan documentation note presence this is considered to be unlikely. Perhaps more likely this can be appointed to a response bias difficult to eliminate from a self reported data collection mechanism or even affected by the sampling method as one can argue that those that are more familiar with the system would be more prone to want to participate in this research.

From analysing the reasons appointed for not using the care plan more frequently the two items most often selected were that the care plans in the system were lengthy, takes the nurses too much time and its difficult to use. These concerns corroborate the findings of Ammenwerth and collaborators (2003) and Mahler and collaborators (2007). Organisational factors were also on the top of the most often selected such as lack of training and not enough computers/workstations. These also had been highlighted by previous studies (Lee *et al.*, 2005; Lee, 2006; Moody *et al.*, 2004; Smith *et al.*, 2005). The focus of nursing practice is the care for their patients, and we've seen from the literature reasoning behind the tradition of descriptive narrative and informal language that continue to be part of the nursing notes and the barriers to change. The hospital where the study was developed, like many others, had very heterogeneous documentation

methods, where, in general, what were considered to be nursing care plans were more clinical pathways, care bundles, aid-memoires amongst other strategies. So there wasn't really a knowledge base on documenting based on the nursing process, equally there was no standardised language in place and very little understanding of how to use it.

In the questionnaire, nurses also highlighted aspects related to difficulty of use could, although that could not be determined if related to the perception of usability of the electronic system, the structure of the care plans, and lack of practice/experience with system.

Important to note that reasons pertaining to language/terminology used was less frequently selected as a negative factor which one would expect to see mentioned more often in concurrence with findings of Lee and collaborators (2005) Hayrinen and collaborators (2010) and Meum and collaborators (2013) that appoint the barriers related to the language utilised in care plans as a reason for difficulty in acceptance by nurses.

In order to answer the third research question: what is the relationship between nurses' perceptions and attitudes towards care planning a correlation of variables was performed analysing the answers to the questionnaire.

There was also a moderate statistic correlation between the decision support mechanism and the accuracy of care plans that these suggest (rho of 0.401). It is considered logical that those that have a positive experience with the system will also show a greater level of satisfaction as supported by the D&M IS success model (DeLone & McLean, 2003).

Perhaps the most relevant correlation found (albeit not the strongest) was the moderate positive correlation observed between the opinion of the content of the care plans available in the system and the frequency of use of the care planning module within the EHR (rho of .680). There were also positive correlations although weak (0.3 -0.5) between item reported frequency of use and usability and perceived benefits. This is supported by other studies findings indicating a correlation with nurses' attitudes and their behaviour toward care planning documentation technology (Darbyshire, 2004; Lee *et al.*, 2005; Lee, 2006; Moody *et al.*, 2004; Smith *et al.*, 2005; van Ginneken, 2002; Oroviogoicoechea, 2008). This is demonstrated by the fact that nurses' opinions regarding content and usability were overall negative (although those regarding perceived benefits were positive) and the overall reported use of the care planning is low.

5.1 Limitations of this study and its strengths

In relation to the questionnaire, one of the limitations of this study is to do with the size of the sample with only an estimated 10% (n=137) of the population, in hindsight we could have accounted more time for the collection of data through the questionnaires although not certain it would produce significantly better results. Although, as in other similar studies, researchers have to use what is available instead of strict mathematical sampling strategies due to the difficulty in accessing large appropriate samples (Punch, 2014). Also the advantages of an online self report were outlined in chapter 3 but it's also subject to recall bias and errors in self-observation (Hawkshead & Kroussel-Wood, 2007).

The data collection method, however, was conducted based on findings from other studies, the overall Cronbach's alpha was weak (0.659) but when we looked at the constructed variables

alone the Cronbach's alpha was good (0.862). It wasn't found in the literature a validated tool that would serve the purposes of this research, as questionnaires tend to be individualised to address pertinent questions do the organization where they are developed, and the generic ones found in literature were examining electronic health records adoption or nursing documentation in general and not focused on care planning alone. Also we were able to perform internal validity tests but not external validity or reliability tests that would strengthened the use of the questionnaire not only for this instance but to allow replication of the present study.

One of the strengths of this study is believed to be the combination of different quantitative data collection methods which for a descriptive study allowed exploring the problematic via different perspectives and gather a greater understanding.

6. Conclusion

Chapter 6 - Conclusion

This is the conclusion chapter of this thesis. Here the key finding of the study are presented alongside the contribution of this research to current knowledge. It also discusses implication for practice and areas of possible research.

The literature review demonstrated the nursing profession efforts to consolidate the use nursing process and the importance of making it transpire in the documentation that nurses do. It also reveals the central role of nursing in the interdisciplinary team and the importance of breaking away from free text narrative of low significance. It was mentioned how the efforts of nurses at international level to make use of standardised terminologies and the potential benefits for patients, nurses and organizations of doing so and at the same time explored the difficulties observed and factors affecting its application to practice. It was discussed how the use of standardised nursing terminologies in nursing practice and how the successful implementation of these have lead to increase completeness of documentation and evidence based practice. The review described the impact of electronic health records and information technology in healthcare and its potential to really draw on the benefits of purposeful documentation. It highlighted the opportunity for research in nursing informatics by making use of the wealth of information nurses collect in their day to day practice. The review also highlighted the disruptive impact and the importance to understand the change process and the factors that impact the success of such implementations. The literature also identified a gap in information of the implementation of standardised languages in the United Kingdom in particular using quantitative methodologies.

The present study utilised two different methods of quantitative approach in order to build on previous research studies and describe current practices in one of the biggest hospitals of the United Kingdom. This research was able to provide insight on how much nurses document the patients' care plan, by identifying nursing diagnosis following initial assessment, appropriate interventions, and evaluating the outcomes, revealing that almost all admitted patients admitted to this hospital have at least one care plan identified, on the other hand it was observed that the care plans were very rarely documented after being applied to patients. Combined to these two metrics we observed that both the absolute number of care plan templates used and the variety of the domains covered by them has been increasing over the last 13 months, boosted by clinical decision support mechanism.

Another objective of this study was to analyse the nurses' perceptions and attitudes towards the perceived benefits, content and usability of the system and how these and what other factors impacted on the perceived use. Although the perceptions of benefits of care planning in the electronic system were positive, the variables for appreciation of content and usability were negative. Factors affecting the self-reported use were mainly training (both reported as a reason by the respondents themselves) and by observed statistical significance in inferential analysis; opinions and perceptions over the available content; usability and perceived benefits of the electronic system for the documentation of the care plan.

It is believe that this study makes an important contribution to knowledge in the fact that reports on factors that contribute to the compliance of nursing documentation with professional standards, in particular with the use of an electronic health record system. It can inform hospital policy in terms of implementation and rollout of similar functionality, highlighting the importance of addressing staff concerns and contribute to a change of perception in order to realise the benefits of its use. It also reinforces the importance of training not only technical/functional in terms of learning how to work with the electronic system but also in terms of nursing process and critical thinking.

The implementation of an electronic health record and of a common nursing language is not a one-off process, but a continuum, therefore it is encouraged future research continuing to evaluate the embedment of practices, and confirm the relationships observed in this study.

This study also highlights the lack of research on the use of clinical decision supports in the nursing arena and it could be explored how these can help or hinder the application of the nursing process.

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8. Annexes

ANNEX 1 – Questionnaire

Nursing Care Planning in Epic

Survey information and consent

Thank you for your interest in participating in this online questionnaire. Please read carefully the following information that explains the reasons behind it and what it involves.

The purpose of this survey is to understand the nurse's opinion of the care planning documentation using our electronic heath record and of the clinical decision support mechanism that automatically suggests certain care plans depending on previous documentation for your patients.

It is aimed at all qualified nurses and midwives that work on inpatient areas and frequently use Epic to document the care provided for our hospitalized patients. Even if you do not frequently use the care plan activity with the Epic system but you still look after admitted patients your opinion is just as important to us.

To participate all you need to do is complete this online survey. We will be asked about care planning documentation and the use of the electronic system, we will also ask a few questions about yourself, including your age and professional experience. Completing the survey should take about 10 minutes and you can do this from any device with an internet connection.

Additional information

This questionnaire is registered with Safety and Quality Support (PRN 4858) as a service evaluation entitled "The role of clinical decision support in improving nursing care plan documentation in an acute hospital setting," which is being conducted by Flavio Monteiro, as part of a master of science degree held by Porto University, Portugal. It will complement a quantitative analysis of the care planning documentation data extracts from the system in the previous 12 months and it hopes to help understanding how nurses see care planning and the use of classified language in the context of the recent electronic health record implementation.

This survey is anonymous. No one, including the researcher, will be able to associate your responses with your identity.

Your participation is voluntary. You may choose not to take the survey, to stop responding at any time, or to skip any questions that you do not want to answer. Your completion of the survey serves as your voluntary agreement to participate in this research project and your certification that you are a qualified nurse working for Cambridge University Hospitals NHS Foundation Trust.

Questions regarding the purpose or procedures of this study should be directed to the Service Evaluation Lead using this e-mail address

1) Consent to participate in the study exploring the nursing care planning documentation.
Please select both options to indicate that you agree and are eligible for participation in this study.
*

[ ] I understand the study described above and agree to take part.

[ ] I am a qualified Nurse or Midwife.

Nursing care planning

Logic: Show/hide trigger exists.

2) How often do you use the care planning activity in Epic?*

( ) Never use

( ) Almost never

( ) Occasionally / Sometimes

( ) Almost every shift

( ) At least once per shift

3) What do you consider to be the influence of the nursing documentation on the quality of care provided?

( ) Not at all influential ( ) Slightly influential ( ) Somewhat influential ( ) Very influential ( ) Extremely influential

4) How would you rate the impact the care plan documentation has on the individualisation of care?

( ) Very Low ( ) Low ( ) Moderate ( ) High ( ) Very High

5) How important do you consider it to document identified patient problems / nursing diagnoses?

( ) Not important ( ) Slightly important ( ) Moderately important ( ) Important ( ) Very important

6) What do you consider to be the influence of the quality of nursing care provided on the quality of the documentation produced?

( ) Extremely influential ( ) Very influential ( ) Somewhat influential ( ) Slightly influential ( ) Not at all influential

7) Do you agree that the care plan documentation in the electronic health record system reduces ambiguity of interpretation?

( ) Strongly disagree ( ) Disagree ( ) Neither agree or disagree ( ) Agree ( ) Strongly agree

8) How much do you agree or disagree with the following statement: "I believe that, in time, the use of care plans in the electronic health record will lead to improved patient care"?

( ) Strongly disagree ( ) Disagree ( ) Don't agree or disagree ( ) Agree ( ) Strongly agree

9) How do you regard the quality of the information the documented care plan provides you about your patients?

( ) Very poor ( ) Poor ( ) Acceptable ( ) Good ( ) Very good

10) How would you describe the difficulty of reviewing the nursing evaluation of patient progress from the nursing care plan?

( ) Very difficult ( ) Difficult ( ) Neutral ( ) Easy ( ) Very easy

11) How would you describe the difficulty in finding the care that is planned for your patients in the electronic patient record?

( ) Very difficult ( ) Difficult ( ) Neutral ( ) Easy ( ) Very easy

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Care Plan Use

The following questions aim to describe your experience with the care plan documentation in the Electronic Health Record

Logic: Hidden unless: Question "How often do you use the care planning activity in Epic?" #2 is one of the following answers ("Never use","Almost never","Occasionally / Sometimes")

12) If not frequently using the care planning activity in Epic, what are the main reasons for not doing so? (select all that apply)

[ ] Takes too much time

[ ] Don't think it's necessary

[ ] Difficult to use quantitative measurement of the patient assessment

[ ] Too much content (available care plans very lengthy)

[ ] Lack of training

[ ] Not enough content (relevant care plan templates to choose from) available in the system

[ ] Find it difficult to use

[ ] Don't think the care plan documentation will be visible to other professionals

[ ] Language / terminology is difficult to understand

[ ] Not mandatory

[ ] Not enough computers / workstations

[ ] Other - Please comment: _____*

Logic: Hidden unless: Question "How often do you use the care planning activity in Epic?" #2 is one of the following answers ("Almost never","Occasionally / Sometimes","Almost every shift","At least once per shift")

13) To what extent do you consider the care plan documentation to reflect the actual care that you provide to your patients?

( ) Not at all ( ) Very little ( ) Somewhat ( ) To a reasonable extent ( ) Almost always

Logic: Hidden unless: Question "How often do you use the care planning activity in Epic?" #2 is one of the following answers ("Almost never","Occasionally / Sometimes","Almost every shift","At least once per shift")

14) How much guidance and support do you consider the CUH care plans available in Epic offer to yourself or colleagues on how to address particular patient identified problems / nursing diagnosis?

( ) Never ( ) Rarely ( ) Occasionally ( ) A moderate amount ( ) A great deal ( ) Don't know - not familiar enough with available content

Logic: Hidden unless: Question "How often do you use the care planning activity in Epic?" #2 is one of the following answers ("Almost never","Occasionally / Sometimes","Almost every shift","At least once per shift")

15) How much do you agree or disagree with the following statement: "I consider the nursing interventions for each identified patient problem to be clearly documented in the care plan"

( ) Strongly disagree ( ) Disagree ( ) Don't agree or disagree ( ) Agree ( ) Strongly agree

Logic: Hidden unless: Question "How often do you use the care planning activity in Epic?" #2 is one of the following answers ("Almost never","Occasionally / Sometimes","Almost every shift","At least once per shift")

16) Do you think that prescribing nursing interventions in the care plan activity is:

( ) Very difficult ( ) Difficult ( ) Neutral ( ) Easy ( ) Very Easy

Logic: Hidden unless: Question "How often do you use the care planning activity in Epic?" #2 is one of the following answers ("Almost never","Occasionally / Sometimes","Almost every shift","At least once per shift")

17) Do you think that evaluating the result of nursing care by selecting an outcome rating in the care plan activity is:

( ) Very difficult ( ) Difficult ( ) Neutral ( ) Easy ( ) Very easy

---

Care Plan CUH Content

The following questions are regarding the content of CUH specific care plan templates and the automatic triggers - by use of Best Practice Advisories - that suggest certain care plan templates to be added to the patient's care plan based documentation that exists for that patient encounter.

18) How much do you support or oppose to care plans being automatically suggest based on existing documentation?

( ) Strongly oppose ( ) Somewhat oppose ( ) Neutral ( ) Somewhat favor ( ) Strongly favor

Logic: Hidden unless: Question "How often do you use the care planning activity in Epic?" #2 is one of the following answers ("Almost never","Occasionally / Sometimes","Almost every shift","At least once per shift")

19) In general, how much do you agree with the care plan templates that are automatically suggested to you?

( ) Strongly disagree ( ) Disagree ( ) Neither agree or disagree ( ) Agree ( ) Strongly agree ( ) Don't know - not familiar enough with available content

Logic: Hidden unless: Question "How often do you use the care planning activity in Epic?" #2 is one of the following answers ("Almost never","Occasionally / Sometimes","Almost every shift","At least once per shift")

20) When you see a BPA (Best Practice Advisory) suggesting a certain care plan template to be added to your patient's care plan, how frequently would say it's clear to you why that care plan is being suggested?

( ) Never ( ) Almost never ( ) Occasionally / Sometimes ( ) Almost every time ( ) Every time ( ) Don't know - not familiar enough with available content

Logic: Hidden unless: Question "How often do you use the care planning activity in Epic?" #2 is one of the following answers ("Almost never","Occasionally / Sometimes","Almost every shift","At least once per shift")

21) Focusing on care plans configured specifically for CUH (prefixed by CUH when you apply a new template or accept a suggested care plan via a BPA), how do you rate the quality of their content?

( ) Very poor ( ) Poor ( ) Acceptable ( ) Good ( ) Very good ( ) Don't know - not familiar enough with available content

22) How would you rank the following options/methods to devise the care plans for your patients?
(please select the number corresponding to the order of your preference: select 1 for the option you prefer the most and 4 for the one you least prefer)

_____Accept suggested care plans from BPAs that trigger based on existing documentation

_____Manually build (identify each problem, goal and intervention) a care plan every time

_____Having care plan templates automatically applied to your patients (without requiring a decision from a nurse)

_____Manually apply pre-configured care plan templates (with option to select appropriate interventions)

Logic: Hidden unless: Question "How often do you use the care planning activity in Epic?" #2 is one of the following answers ("Almost never","Occasionally / Sometimes","Almost every shift","At least once per shift")

23) How difficult / easy do you consider to be individualizing the care plan for your patients using the care plan activity in Epic?

( ) Very difficult ( ) Difficult ( ) Neutral ( ) Easy ( ) Very easy

---

About you

The following questions aim to understand a little bit about yourself and your experience to serve as a context to the answers provided previously. Again all information you provide is strictly confidential.

24) What is your age (in years)?

_____

25) How many years of nursing experience do you have (approximately)? (please only consider completed years so if less than 1 year please write in '0')

_____

26) How much experience with the current hospital Electronic Health Record system do you have (in months, counting from when you first had your initial training or started using the system) ?

_____

27) Have you had formal training on how to use care planning activity in Epic? (you can choose more than one option)

[ ] Yes - In my initial Epic training

[ ] Yes - Attended a care planning masterclass session

[ ] No

[ ] Don't know / can't remember

28) Does your current role involve frequent direct patient care? (by frequent is understood that more than 50% of your time)

( ) Yes

( ) No

29) Which area of activity do you consider to best describe where you work the majority of your time (more than 50% of your shifts)?

( ) Inpatient areas

( ) Outpatient areas

( ) Day admits / day unit

( ) Other - Please comment: _____*

30) Which area of nursing do you consider to best describe your current practice? If your work involves more than one please select all that apply.

[ ] Adult Nursing

[ ] Paediatric

[ ] Research

[ ] Practice Development / Learning and Development

[ ] Maternity / Midwifery

[ ] Intensive Care

[ ] Specialist Nurse

[ ] Theatres / Intervention Radiology

[ ] Oncology

[ ] Emergency

[ ] Other - Please comment: _____*

31) What is your current nursing band?

( ) Band 5

( ) Band 6

( ) Band 7

( ) Band 8 or above

Thank You!

Thank you for participating in this study. Your response is very important to us.

ANNEX 2 – distribution of care plan notes

	Total			Adult Surgery			ITU/HDU			Theatres		
	n days without care plan note	n days with care plan note	**% of days with care plan notes**	n days without care plan note	n days with care plan note	**% of days with care plan notes**	n days without care plan note	n days with care plan note	**% of days with care plan notes**	n days without care plan note	n days with care plan note	**% of days with care plan notes**
Jul-15	23181	29	**0.1249%**	6146	11	**0.179%**	1646	0	**0.000%**	164	0	**0.000%**
Aug-15	22518	1	**0.0044%**	5609	0	**0.000%**	1973	0	**0.000%**	194	0	**0.000%**
Sep-15	22688	8	**0.0352%**	6013	0	**0.000%**	1882	1	**0.053%**	107	0	**0.000%**
Oct-15	24094	2	**0.0083%**	5863	0	**0.000%**	2609	0	**0.000%**	101	0	**0.000%**
Nov-15	21770	0	**0.0000%**	5688	0	**0.000%**	1962	0	**0.000%**	113	0	**0.000%**
Dec-15	23244	6	**0.0258%**	5391	0	**0.000%**	1993	0	**0.000%**	92	0	**0.000%**
Jan-16	24876	36	**0.1445%**	6481	0	**0.000%**	1866	0	**0.000%**	112	0	**0.000%**
Feb-16	23832	33	**0.1383%**	6000	0	**0.000%**	1750	1	**0.057%**	126	0	**0.000%**
Mar-16	25560	13	**0.0508%**	6212	0	**0.000%**	1953	0	**0.000%**	106	0	**0.000%**
Apr-16	21822	27	**0.1236%**	6154	0	**0.000%**	1577	2	**0.127%**	96	0	**0.000%**
May-16	23484	19	**0.0808%**	6438	0	**0.000%**	1799	2	**0.111%**	110	0	**0.000%**
Jun-16	20588	39	**0.1891%**	5660	0	**0.000%**	1430	3	**0.209%**	111	0	**0.000%**
Jul-16	19570	157	**0.7959%**	5278	0	**0.000%**	1502	13	**0.858%**	90	1	**1.099%**

	Oncology			Adult Medicine			Paediatrics			Obstetrics		
	n days without care plan note	n days with care plan note	**% of days with care plan notes**	n days without care plan note	n days with care plan note	**% of days with care plan notes**	n days without care plan note	n days with care plan note	**% of days with care plan notes**	n days without care plan note	n days with care plan note	**% of days with care plan notes**
Jul-15	2166	1	**0.046%**	12260	17	**0.138%**	640	0	**0.000%**	159	0	**0.000%**
Aug-15	1877	0	**0.000%**	11911	1	**0.008%**	790	0	**0.000%**	164	0	**0.000%**
Sep-15	1994	0	**0.000%**	11405	5	**0.044%**	1098	0	**0.000%**	189	0	**0.000%**
Oct-15	1787	0	**0.000%**	12483	2	**0.016%**	1046	0	**0.000%**	205	0	**0.000%**
Nov-15	1635	0	**0.000%**	11385	0	**0.000%**	853	0	**0.000%**	134	0	**0.000%**

Dec-15	1891	0	**0.000%**	12654	6	**0.047%**	1068	0	**0.000%**	155	0	**0.000%**
Jan-16	2066	4	**0.193%**	13205	32	**0.242%**	982	0	**0.000%**	164	0	**0.000%**
Feb-16	1673	5	**0.298%**	12987	25	**0.192%**	1116	0	**0.000%**	180	0	**0.000%**
Mar-16	2170	0	**0.000%**	13970	11	**0.079%**	977	0	**0.000%**	172	2	**1.149%**
Apr-16	2004	1	**0.050%**	11010	22	**0.199%**	841	0	**0.000%**	140	0	**0.000%**
May-16	1582	2	**0.126%**	12380	12	**0.097%**	1006	0	**0.000%**	169	0	**0.000%**
Jun-16	1838	1	**0.054%**	10482	29	**0.276%**	871	0	**0.000%**	196	0	**0.000%**
Jul-16	1582	0	**0.000%**	10133	109	**1.064%**	791	0	**0.000%**	194	0	**0.000%**

ANNEX 3 – total number of care plans and its distribution over time

	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15
All Care Plans	7739	7845	8709	11326	11689	19361
8-Pressure Ulcer	3	3	2	1		3
39-Sepsis (Adults)					*32	120
41-Essential Care (adults)					*1198	2466
42-Sepsis (Paediatrics)						
43-Essential Care (Paediatrics)					*74	190
44-Care of patient in last days of life						
45-Peripheral Venous Access						*2434
46-Central Venous Access						*614
47-Diarrhoea						*338
48-Nutrition						*514
49-Specialling						
50-Risk for Falls		*393	324	308	276	333
51-Acute Pain						*376
52-Nausea						
53-Constipation						
54-Wound Care						*478
55-Restricted Mobility						*1170
57-Safeguarding						

80-Pressure Ulcer Prevention	1614	1700	1796	1691	1484	1581
81-Admission Care (Adults)	4474	4425	4516	4568	4429	4496
82-Admission Care (Paediatrics)	515	438	492	530	483	461
85-Discharge Care			*919	3514	3017	3206
210003-NUTRITION DEFICIT	698	618	604	671	666	549
30400002-IMBALANCED NUTRITION: LESS THAN BODY REQUIREMENTS			2	6	3	5
30400001-IMBALANCED NUTRITION: MORE THAN BODY REQUIREMENTS				1		10
30400003-RISK FOR IMBALANCED NUTRITION: MORE THAN BODY REQUIREMENTS	17	4	15	13	11	
30400014-BOWEL INCONTINENCE	22	5	25	17	11	9
30400155-RISK FOR FALLS	353	252	1			3
30400020-FUNCTIONAL URINARY INCONTINENCE			2	1		
30400031-INEFFECTIVE AIRWAY CLEARANCE						
30400090-IMPAIRED TRANSFER ABILITY	13		1			
30400092-ACTIVITY INTOLERANCE	5			1		
30400108-BATHING SELF-CARE DEFICIT	6	1	1			
30400109-DRESSING SELF-CARE DEFICIT	5					
30400110-TOILETING SELF-CARE DEFICIT	12	1	1			
OTHERS	2	5	8	4	5	5

	Jan-15	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16
All Care Plans	27109	22720	26840	27584	28285	27775	29198
8-Pressure Ulcer	3	4	6	50	68	58	65
39-Sepsis (Adults)	155	149	158	160	134	154	174
41-Essential Care (adults)	2405	2078	2400	2400	2562	2492	2660

42-Sepsis (Paediatrics)			*7	19	17	18	28
43-Essential Care (Paediatrics)	170	157	184	174	187	161	159
44-Care of patient in last days of life		*2	4	3	6	1	10
45-Peripheral Venous Access	3764	3499	3806	3787	4036	3973	4093
46-Central Venous Access	721	642	736	677	712	688	724
47-Diarrhoea	462	402	438	511	470	465	502
48-Nutrition	937	821	910	873	902	843	959
49-Specialling			*144	292	272	274	268
50-Risk for Falls	334	335	**1168	2064	2167	2098	2189
51-Acute Pain	2323	2090	2130	2149	2262	2224	2393
52-Nausea			*135	412	388	424	403
53-Constipation			*944	1946	2050	2095	2076
54-Wound Care	2075	1907	2025	798	232	264	287
55-Restricted Mobility	3841	1850	2069	1831	1885	1766	1904
57-Safeguarding						*16	65
80-Pressure Ulcer Prevention	1622	1357	1622	1735	1823	1791	1941
81-Admission Care (Adults)	4462	4059	4397	4345	4561	4521	4682
82-Admission Care (Paediatrics)	470	463	516	538	541	487	490
85-Discharge Care	3280	2854	2984	2803	2988	2950	3117
210003-NUTRITION DEFICIT	56	33	34				
30400002-IMBALANCED NUTRITION: LESS THAN BODY REQUIREMENTS	6	3					
30400001-IMBALANCED NUTRITION: MORE THAN BODY REQUIREMENTS							
30400003-RISK FOR IMBALANCED NUTRITION: MORE THAN BODY REQUIREMENTS							

30400014-BOWEL INCONTINENCE	12	6					
30400155-RISK FOR FALLS	6						
30400020-FUNCTIONAL URINARY INCONTINENCE	2	7	19	6	8	4	3
30400031-INEFFECTIVE AIRWAY CLEARANCE					3	2	3
30400090-IMPAIRED TRANSFER ABILITY							
30400092-ACTIVITY INTOLERANCE				2			
30400108-BATHING SELF-CARE DEFICIT							
30400109-DRESSING SELF-CARE DEFICIT							
30400110-TOILETING SELF-CARE DEFICIT							
OTHERS	3	2	4	9	11	6	2

ANNEX 4 – Cronbach's alpha off all items in the questionnaire

Questionnaire item:	Scale Mean if item deleted	Scale variance if item deleted	Corrected item - total correlation	Square multiple correlation	Cronbach's alpha if item deleted
2	100.04	592.104	0.254	0.788	0.653
3	99.88	577.773	0.418	0.780	0.644
4	100.00	575.909	0.495	0.863	0.642
5	98.81	594.159	0.297	0.701	0.653
6	100.00	585.091	0.418	0.788	0.648
7	103.25	603.313	0.047	0.836	0.660
8	102.90	595.671	0.179	0.887	0.655
9	100.33	578.951	0.532	0.899	0.644
10	103.90	581.943	0.490	0.954	0.646
11	103.66	584.017	0.406	0.828	0.647
13	100.15	580.705	0.503	0.872	0.645
14	100.25	581.980	0.390	0.830	0.647
15	103.24	587.548	0.318	0.775	0.650
16	103.61	589.059	0.323	0.811	0.651
17	103.91	592.477	0.299	0.771	0.652
18	103.15	582.614	0.465	0.869	0.646
19	103.01	587.348	0.437	0.826	0.649
20	100.10	586.913	0.363	0.733	0.649
21	100.58	574.368	0.574	0.871	0.641
22.1	100.84	613.594	-0.132	0.668	0.666
22.2	100.51	626.011	-0.329	0.753	0.674
22.3	100.51	625.678	-0.359	0.804	0.673
22.4	101.18	619.664	-0.246	0.807	0.670
23	103.73	587.593	0.415	0.778	0.649
24	67.66	356.926	0.491	0.837	0.634
25	92.39	345.908	0.694	0.891	0.556
26	85.85	509.614	0.159	0.701	0.686

ANNEX 5 – Safety and Quality Support Form

Registration Form – Service Evaluation

Project Title	*"The role of clinical decision support in improving nursing care plan documentation in an Acute Hospital setting"*					
Main Contact	Flavio Monteiro					
Post Held	Senior Application Analyst					
Clinical Department	**eHospital**					
Contact Information	**Telephone**	**254274**	**Bleep**	**NONE**	**Box No.**	**117**
Email	☒ **Trust email system. If another email address is to be used please state:** (Double click and click Checked)					
Start Date	**11/04/2016**		**Estimated Completion Date**		**31/08/2016**	
Service Evaluation Lead (Consultant/Senior Clinician responsible for the project)	**Flavio Monteiro**					
Co-Auditors (Person/s carrying out the audit)	**None**					
Participant (Minimal Involvement)	**Paulino Sousa, Rachel Jones**					
Aim/Objectives What do you hope to achieve? What is the anticipated impact on clinical care, and potential benefit to patients/staff?	The objective of this study is to evaluate the impact of using clinical decision support (CDS) systems on the nursing care planning documentation within an Electronic Health Record (HER). Secondarily we intend to evaluate the introduction of such system from the nursing professional's perspective as end users of the EHR trying to understand its impact on the nursing documentation workflow and application of the nursing process.					

Supporting literature/ evidence based references if applicable
Example: National Guidelines/ Trust wide policies and procedures

The nursing process, by making use of standardized terminology, provides a good structure for the documentation of the nursing care in electronic systems not only facilitating decision making in patient care and care planning but it also enables data to be utilized in clinical research, health care management, health services planning and even for governmental reporting (Hayrinen K, Lammintakanen J & Saranto K, 2010). There are several studies highlighting the role of Electronic Health Records (EHR) in the standardization and structure of the documentation increasing the potential use of the information collected. By making use of a standard language, computerization allow for high level data analysis which can contribute greatly for the scientific knowledge by identifying relations between problems, interventions and their respective outcomes (Wyatt JC, Wright P, 1998).

Although the reference to nursing diagnosis is widely used in nurse care planning literature, the integration of such terminology in nursing practice is still proving problematic. Reasons for the poor implementation are: high documentation efforts, low quality of paper-based records and limited general acceptance of the nursing process (Mahler et al, 2010). In one of the first articles referring to the implementation of an electronic care planning system in the UK written by Newton C, (1995) it was explored the nurses attitudes towards the new care planning system and the nursing process. The results showed that the overall perception

was negative and it took more than one year for the nurses' to shift towards positive attitudes. Similar findings were observed by Larrabee *et al.* (2001) in a study conducted in Tennessee (USA) evaluating the nursing documentation before and after implementing a nursing information system only recorded an increase in documentation quality after 18 months and only after retraining of nurses.

In an attempt to reduce the time spent in documentation as well as to help nurses to follow a common plan in caring for specific group of patients based on up-to-date, evidence based knowledge many organizations make use of standardised care plans. (Dahm M and Wadensten B, 2009). Of course there are drawbacks with this approach, as those explored by a Lee, Yeh and Ho (2002) article following the implementation of a Nursing Care Planning System in an ICU in Taiwan. Although overall viewing standardized care plans as positive, the main concern was over de-individualization of the care plan and the loss of critical thinking. Other issues highlighted were around increasing time on documentation and difficulties in using standardized nursing diagnosis. Similar conclusions were reached by Mahler C et al (2007) in a similar study this time across 4 different wards in a Germany University Hospital, where the number of problems, outcomes and interventions documented increased greatly but not always adapted to the patients needs.

This study will explore the nursing care plan documentation and the use of a standardized language in the description of the nursing process in the context of a recently implemented EHR but particularly focus on the use of Clinical Decision Support (CDS) as a way of enhancing the adoption of introduced model.

The clinical judgments that evolve from the nursing practice depend on the nursing professional's ability to analyse, interpret and infer from the available data. This, according to Sousa (2006) can be supported and enhanced in a context of a Nursing Information System if based in relevant data that help to inform the nurses in their decision process. Osheroff (2009) also described the potential of CDS in helping new nurse clinicians and nursing student to learn nursing practice and guide their actions and decision

Population (target group from which sample will be taken)	**All admitted patients for with a length of stay greater than 23 hours and all registered nurses**
Estimate of sample size/time period	**Patient episodes over a period of 6 months. Staff sample will be a convenience sample sending over e-mail across the nursing network.**
Exclusions (if any)	

Methodology Please detail how you will conduct your service evaluation

☐ Examination of case notes	☐ Interview	☐ Observation of practice	
☐ Proforma	☒ IT systems	**Other:**	Online Questionnaire

Does this project involve any questionnaires to be completed by staff or patients?	☒ Yes	☐ No

All questionnaires must be sent to the Safety & Quality Support Team, Box 243 for approval by the Safety & Quality Co-ordinator prior to being used. Please note that Patient Satisfaction Projects are to be sent to the Patient Satisfaction Co-ordinator, Box 150

Service Evaluation resources Please detail the resources you require from the Patient Safety Unit

☐ Advice	☐ Database design	☐ Report writing
☐ Patient identification	☐ Project design	☐ Presentation support
	☐ Data analysis	☒ No help required

Where will you report the results of the service evaluation to ensure that the recommendations are discussed and are agreed and acted upon? *Please tick all that apply.*		
☐ Governance Meeting	☐ Clinical Department Audit Meeting	**Other** (Please specify) Public thesis defence and written report.
☐ M&M Meeting	☐ Divisional/Directorate Meeting	
	☐ Regional Audit Meeting	

Will you be publishing the report? ***If yes please indicate where*** ? International Journal of Medical Informatics	☐ No	☒ Yes

All fields are mandatory

You are required to send the service evaluation report/ presentation and action plan to Safety & Quality Support for entry onto the Trust's Audit /Service Evaluation Project Register. Copies of the Trust's report and action plan templates are available from the Safety & Quality Support intranet site http://goss1/index.cfm?articleid=4323

You are responsible for any breaches of data protection you may make and this includes naming staff/colleagues in reports/presentations who have not given you written permission to do so and Trust sensitive information. **Data from this project must not be shared with any external or third party without prior consent from Safety & Quality Support.**

This form should be completed electronically and signed by the Audit Lead and Directorate Audit Lead. A confirmation email from each signatory can replace a paper signature When this registration form has been signed, please email to the Safety & Quality Support Box 243. Kindly note that no audit/service evaluation project may commence until it has been registered

From: Butler, Richard
Sent: 07 April 2016 14:31
To: Monteiro, Flavio
Subject: The role of clinical decision support in improving nursing care plan documentation in an acute hospital setting

Dear Flavio, The above service evaluation has been registered with Safety and Quality Support and given the PRN 4858

Kind regards

Richard

Richard Butler

National Guidelines Co-ordinator

Safety and Quality Support

Duxford House

2087